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Electrical Trade Surveys.

WE do not know how far firms and companies engaged in the British electrical and allied industries are satisfied with the reception that has been accorded to the Trade Surveys recently issued by the Economic and Statistical Department of the B.E.A.M.A., nor how far individual members of the industries are in agreement with the material and views that have thus been given publicity, but as on lookers, who are sometimes credited with seeing and hearing more from outside than others from within, we feel that we should be falling short of our duty if we failed to express the opinion that the electrical industry would be more likely to gain ground, both now and later, if it were allowed a season of rest from this activity.

We are not surprised that questions should be asked as to the constitution of the Economic and Statistical Department, what is its *personnel*, from whom as a Department it receives its instructions, by what methods its conclusions are arrived at, whether the Department has a free hand, whether it is to be regarded as expressing the views of the Council, whether its reports are prepared purely for the benefit of firms who are members of the Association of which it forms a section, or whether they are intended for propaganda purposes. To few of these questions are we in a position to give inquirers an answer. But to those who offer criticism of the Surveys we are able to reply here that the last thing that should be possible is for them to be issued without the full authority and backing of the Association.

It will be remembered that in our issue of October 19th, in a more or less playful leaderette entitled "A Fit of the Blues" we deprecated the circulation of a statement by the Department which could only spread gloom everywhere. In reply, the Department indulged in a supercilious and more or less personal diatribe (ELEC. REV., November 2nd, 1928, pp. 781 and 782), the main point in which we suitably dealt with. The Trade Survey dated December, 1928, and summarised, only briefly with regard to detail but more fully respecting its main topic, on another page of this issue, continues the attitude taken up in that letter. It is not our intention to deal with these things

again at this moment—we are more concerned just now to deprecate the superior attitude adopted toward the electrical Press and the views it sees fit to express. The statement to which we took exception in October last undoubtedly filled the purpose of propaganda, and articles published in the financial Press by the chief of the Department had, as our Stock Exchange representative has pointed out, the effect of sending a wave of unpopularity over the electrical share market. The financial Press was reproved by holders, who objected to being told one day that electricity shares were very attractive securities, and a few days later that they were on certain grounds undesirable. The reception given to the present Survey and the fact that some leading papers appear to have ignored it entirely, leads us to point out once more the possibility of rendering the electrical industry and finance unpopular and giving rise to a disposition to disregard the views of the organisation. So much for propaganda and its dangers. In the present Trade Survey the author or authors say "If a trade survey is to be accurate at all, it must state the truth and avoid propaganda." Does the Department really claim, in face of the fact that the Survey has been practically broadcast, that it has avoided propaganda? Propagandism is defined by Webster as "zeal in propagating one's opinions."

There is but one other matter which we may select from many that clamour for attention, namely, the reference to want of co-operation among firms at home, as contrasted with that obtaining in competing countries. If this Survey is prepared by the B.E.A.M.A. staff for members who employ it, it would appear to be an unfortunate corroboration of reports that periodically reach us from quarters that we have little reason to discredit. The Survey mentions that, in spite of the disturbed condition of the home market, there has been a want of co-operative effort and an inability to realise to the full the principle of concerted action, and it cites as one of the first essentials in the furthering of a securer and steadily progressive export trade, adherence to the principle of close co-operation at home. It is found to be impossible to maintain a strong competitive position abroad while the position is not harmonious at home. This may be perfectly true, but here again, while we can only think that the Department may have acted wisely in thus addressing its members, recalcitrant or otherwise, it seems strange to tell the world at large that the British electrical industry is not united.

As a representative organ of the electrical industry it has always been the desire of the Electrical Review to assist every department of that industry with all the knowledge, experience and influence of which it is in possession. When it offers criticism it does so independently and without any axe to grind. It is anxious for the good of all that there shall be no false step, and no unduly unfavourable opinion expressed which shall give the industry a set-back in the public mind—home and overseas—in days which, though they may be sensitive, are yet boundless in possibilities.

Big Plant Contracts.

It is pleasing to be able to round off a year which has brought the electrical industry large switchgear, transformer, cable, and overhead construction contracts for the Electricity Board, with news of substantial generating plant business. We record elsewhere to-day that the London Power Company has placed orders for two 67,250-kilowatt turbo-generators for its new power station at Battersea. They will be manufactured at Rugby and Trafford Park respectively, the former, of course, by the British Thomson-Houston Company and the latter by the Metropolitan-Vickers Electrical Company, giving employment to British workpeople. Further, Messrs. C. A. Parsons & Co., Ltd., have received contracts for two 20,000-kilowatt turbo-alternator sets, one each for Derby and Bradford, and one of 10,000 kilowatts for Canada. In addition, it is announced that the Electricity Commissioners have sanctioned the construction of the super-power station on the Severn, at Ironbridge, by the West Midlands Joint Electricity Authority, four sets of 50,000 kilowatts each being required. The first section will be completed in about two years, so that we may hope for part of this order to be forthcoming for British works early in the year. Still further, early in January the Central Electricity Board will have before it the tenders for 132,000-V transformers required for the South-East England scheme.

Clyde Valley Charges.

In our issue of November 23rd we commented upon the alteration of its system of charging for electricity introduced by the Clyde Valley Electrical Power Co., and suggested that it was likely to discourage the use of energy in a great number of cases. We are glad to learn that the company has now reconsidered the matter and has decided to allow consumers to remain on the former system if they so desire. We are sure that this decision will enhance the company's reputation for fair dealing and will ultimately be to its benefit.

Changes in Switchgear Design.

The great importance of switchgear in the equipment of power stations, sub-stations, and factory installations, due to the onerous duties which it is called upon to discharge, amply justifies the attention which is continually directed to the principles of its construction and the details of its design. That there is abundant scope for improvement in the latter respect is evidenced by the reports of the Electrical Research Association, which foreshadow notable improvements in the design of circuit breakers; it would probably be correct to say that in no branch of electrical equipment is the loading and the rating of the apparatus so indefinite and so little based upon exact experimental data as in the case of heavy switchgear, which, moreover, is a very costly class of plant.

With regard to the principles of design, we can confidently claim for this country the position of pioneer in the direction of metallic enclosure, with or without compound filling, which has largely displaced the spacious cubicle design which formerly held the field. The layout of such switchgear naturally developed on suitable lines, the usual method of isolating the movable components being to draw them forward horizontally from the fixed components. This, however, was not the only way to deal with them, a vertical motion being adopted in some cases, and in our issue of June 15th, 1928, p. 1044, some particulars were given of an interesting and novel design which avoided the necessity of moving the circuit breaker.

In this issue we are privileged to publish for the first time particulars of two other new designs, which involve the principle of vertical motion and embody various improvements calculated to simplify the construction and to reduce the cost of manufacture; also in the description of the Charing Cross Company's new substation there will be found particulars of new switchgear of the vertical drop-down type. Clearly we are witnessing a notable change in practice, which we welcome as evidence of progressive enterprise and as affording hope for economy.

The Swan Lamp Jubilee.

On Thursday next week the Institution of Electrical Engineers will commemorate the jubilee of the carbon-filament incandescent lamp, which was shown in public by the late Sir Joseph Swan at Newcastle-on-Tyne on December 18th, 1878. A short lecture on Swan's work will be delivered by Mr. J. Swinburne, F.R.S., and samples of early lamps will be on exhibition.

Attention is drawn to the fact that this meeting will commence at 5.30 p.m. (light refreshments being served at 5 p.m.), instead of 6 p.m., as usual; it will be followed by the ordinary meeting at about 6 o'clock.

A Large Automatic Sub-station.

Some details of the G.E.C. motor-convertor equipment installed by the Charing Cross Electricity Supply Co., Ltd., in a 3,000-kW London sub-station.

SUITABLE sites for convertor sub-stations being costly and difficult to obtain in most large cities, the Charing Cross Electricity Supply Co., Ltd., has been fortunate in satisfactorily housing the latest addition to its system, which now has to carry a load of 35,000 kW.

Claimed to be the largest automatic motor-convertor sub-station in this country, it is located in part of the basement of Aldwych House, a new block of office buildings in London's busiest west-central area. The dimensions of the room accommodating the plant are 52 ft. by 48 ft., and so neatly has it been arranged that each portion is visible and easily accessible, the whole being compact and adequately ventilated: fresh air enters at the street level through a Premier oil filter, and the hot air from the machines is exhausted through ducts under the floor by a Davidson fan, which starts automatically with the first convertor and continues to run until the last is shut down.

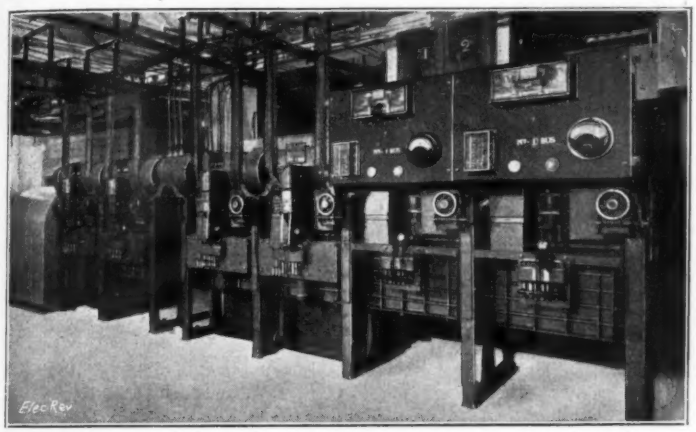


Fig. 1.—Metal-clad a.c., 11,000-volt, Drop-down Switchgear.

The incoming a.c., 11,000-volt, three-phase, 50-cycle supply from the London Power Co., Ltd., *via* Short's Gardens station, is controlled by G.E.C. metal-clad switchgear (fig. 1) incorporating vertical drop-down isolation, features of which include floor space economy due to the avoidance of the need for two pedestals between adjacent breakers and also the forward projection that horizontal withdrawal necessitates. The two incoming feeders terminate in manually-operated oil-immersed circuit breakers of 250,000 kVA breaking capacity, protected by Merz-Price gear; the machines' a.c. switchgear is also metal-clad, the oil-immersed circuit breakers in this instance being motor-operated. Each breaker is lowered and raised by four chains attached to its oil tank and operated by a capstan handle; the breaker is held in the raised position by a bar under the tank, thus preventing the danger of the tank being lowered whilst the breaker remains plugged in. The trip-gear mechanism is interlocked to prevent a breaker being lowered or raised while its contacts are closed. Busbar selection is accomplished in a few minutes with the aid of "revolving turret" plug-contacts, the operation being performed in the following manner: the circuit breaker having been lowered to the isolating position, each turret is rotated through an angle of 180 degrees (after first lifting its locking bolt) the breaker being then raised again into contact. A shutter protects the busbar contacts and is common to all six plugs, three on each set of busbars, it being impossible to expose the contacts of both sets of busbars simultaneously. The shutter-operating bar is fixed to the centre turret, the position of which automatically ensures that the proper busbar plugs are disclosed on raising the breaker; furthermore, the fact that the shutter covers the entrance to all six socket sheaths precludes the possibility of raising the breaker into position with one or two of the turrets incorrectly located. The busbar chambers are filled with solid compound and the current transformer chambers with heavy oil. Bakelised manilla paper plates fixed into the ends of each section of the chamber support the busbars, which are further insulated, where they pass through these plates, with bushings of similar insulating material. Porcelain is used for the main switch insulators and plug shields. The circuit breakers are of the usual G.E.C. design, being of a heavy and robust character; the tanks are made of welded steel plate reinforced by rolled steel bars, while full protection is provided against any faults which may develop.

The four motor-convertors, each of 750-kW capacity, feed a 200/220-volt d.c., 3-wire distribution network; fig. 2 shows their a.c. ends. The small motors on their bedplates short-circuit the slip rings after the machines have synchronised themselves, and the absence of a centre bearing reduces the length of the machine.

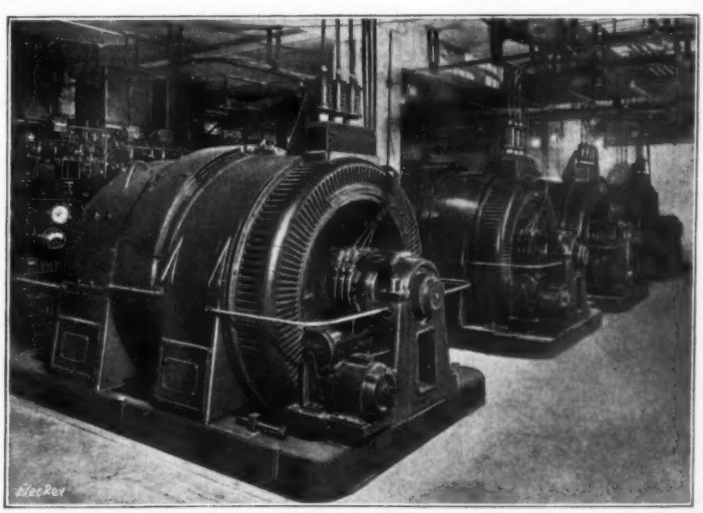


Fig. 2.—The Four 750-kW Automatic Motor-convertors.

(i) Normally the sub-station is controlled automatically by relays governed by the network conditions; the functions of the equipment may be summarised as follows:—(*a*) One machine will start when the busbar

voltage falls to a certain value below the normal and remains so for a predetermined period; the machine will automatically synchronise and parallel itself with the d.c network. (*b*) Should the first machine become loaded to approximately 90 per cent. of its full load and remain so for a predetermined period, or should the first machine fail to take the load, then a second machine will start; the third and fourth machines will also come automatically into operation if the load conditions call for their assistance; each machine as it parallels itself with the busbars will possess a suitable voltage to share the load. (*c*) As the load falls the machines will shut down in the same sequence as that in which they started; that is, the first machine to start up will be the first to shut down, so that each is called upon for an equal period of duty. (*d*) As the machines shut down the switchgear is automatically reset ready for starting again. (*e*) All the gear is protected against faults which may develop, either in the machines and their controlling switchgear, or in the system to which they are connected, *i.e.*, against low a.c. voltage (e.h.p.), broken or reversed phase; a.c. overload (e.h.p.); earth leakage (e.h.p.); excessive d.c. overload; overspeed of machine; l.p. earth leakage; faulty start; reversed polarity; failure to parallel; d.c. reverse current; and overheating by continual overloads.

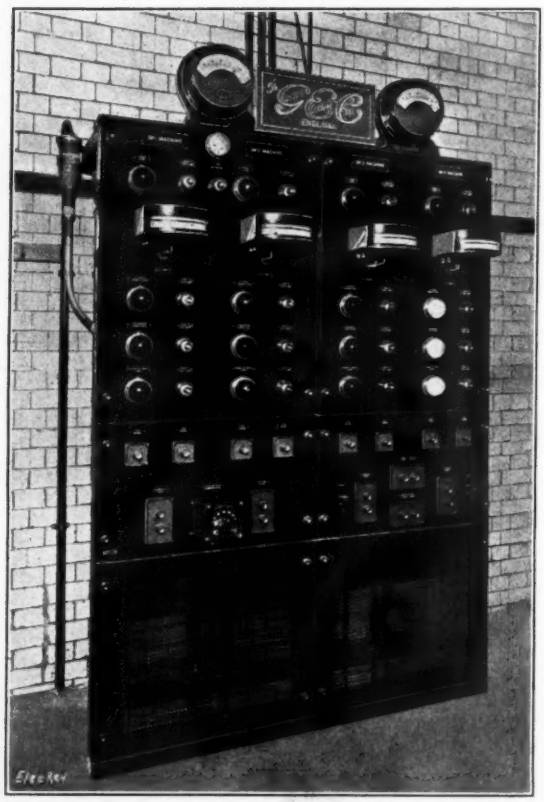


Fig. 3.—Remote-control Panel at Short's Gardens Station.

(ii) Remote control from the Company's power station at Short's Gardens (fig. 3) is accomplished by means of pilot wires, the automatic relays for initiating the starting and stopping of the machines being put out of action meanwhile; it covers the following functions:—(*a*) Starting and shutting down one, or more, machines; (*b*) indicating the position of the switchgear controlling each machine and the synchronising contactors; (*c*) determining the load on each machine; (*d*) indicating the busbar voltage between outers and mid-wire; (*e*) means of varying the setting of the automatic voltage regulating relay; (*f*) means of "volleying," that is, delaying the closing of the d.c. circuit breakers until the desired number of machines is running and then closing all their breakers together; (*g*) determining whether the automatic ventilating fan is running; and (*h*) means of indicating the lock-out of any machine and giving an audible alarm.

(iii) Local control: by the operation of a controller associated with each machine, certain automatic and remote control gear is made inoperative and the machines may be started and stopped as required by push buttons mounted on the relay panels. This method of control is intended for use during routine inspection of the plant and also when it is desired to connect a machine to the testing d.c. busbars, provided so that any weak feeders may be isolated and fed from a separate source during tests, &c. When locally controlled, the synchronising and paralleling of machines remain automatic and all protective features are operative.

(iv) In addition, provision is made to operate any or all, machines manually in an emergency.

The 200/240-volt d.c. switchboard (fig. 4) consists of 13 panels, the centre one being a master control panel. There are three panels for each machine: on two of them, which control the d.c. output, are mounted the circuit breakers and metering equipment, while the third is for relay controls, &c.

The outgoing d.c. feeders are controlled by a switchboard that was manufactured and erected by the Charing Cross Electricity Supply Co.'s engineers. Each feeder panel, of which there are 16, is fitted with circuit breakers with overload trips and metering equipment.

With the exceptions already mentioned, the whole of the Aldwych House plant was manufactured by the General Electric Co., Ltd.

Subsequently to inaugurating the sub-station, Mr. W. F. Fladgate, M.V.O. (chairman of the Charing Cross E.S. Co.), presided at luncheon at the Savoy Hotel, the speakers being the chairman, Mr. M. J. Railing, M.I.E.E. (director of the G.E.C.), Sir John Gatti, L.C.C. (managing director of the Charing Cross Co.), Sir Andrew Duncan (chairman of the Central Electricity Board), and Mr. W. B. Thorpe, M.I.E.E., M.I.Mech.E. (engineer-in-chief of the Charing Cross Electricity Supply Company, Limited).

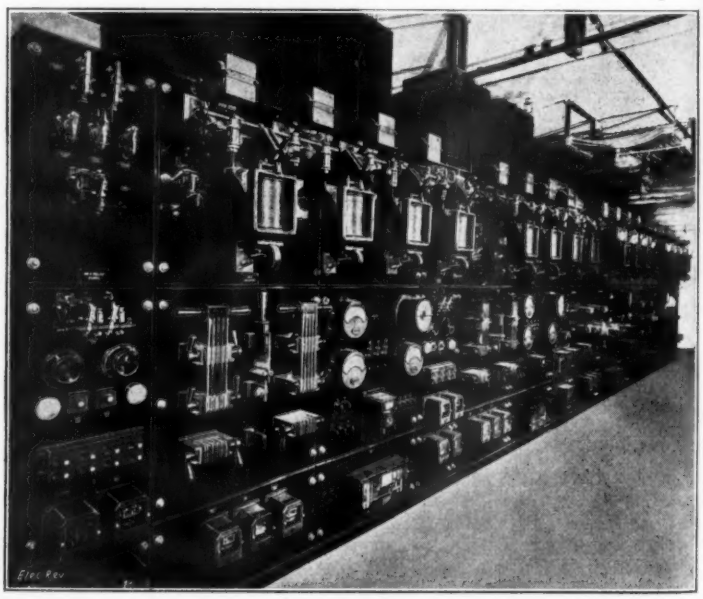


Fig. 4.—Low-voltage d.c. Switchboard controlling the Machines.

A New Era in Switchgear.

The Author describes, for the first time, the new "Class Z" Switchgear of the British Thomson-Houston Co., Ltd.

By H. TRENCHAM, M.Inst.C.E., M.I.E.E.

IN these days wherein the number of types and designs of switchgear is legion, the manufacturer who offers a new line of apparatus owes the industry an apology if he cannot satisfactorily show wherein that new line will justify its existence. The mere fact that it is different from other lines is, taken alone, a drawback and a handicap rather than an advantage, as it tends to create still greater diversity in a situation where multiplicity of demand is the predominating factor in producing high prices. At no time in the history of this country has the cost of electricity supply loomed so largely in the public eye as at the present, and because every item of cost must eventually be passed on to and borne by the public, all unnecessary cost in switchgear work can only be regarded in the long run as a betrayal of the public by the industry.

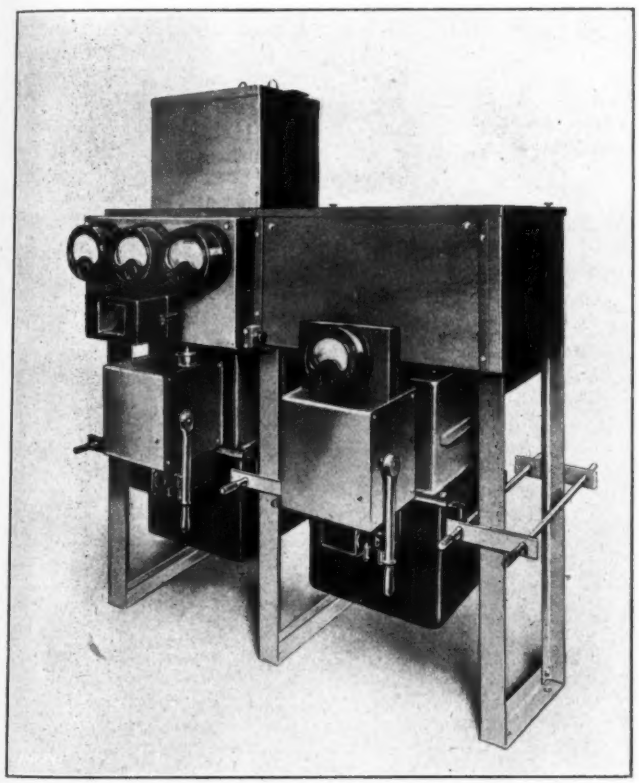
There is no need to produce proof of the immense variety of switchgear products to be found in any of our large switchgear factories. Everyone acquainted with the business knows this, and also recognises that much of it is inevitable and results from the universality of electrical service. Very much of it, however, has been the result of general catering for a diverse demand, and the same class of service may frequently utilise three or four different types of apparatus with resulting waste effort to the industry.

The cost of switchgear is high, and, in the circumstances prevailing, it is quite natural that it should be so, because the ratio of labour and material costs to other charges cannot be improved so long as a large amount of special effort is required to define and produce its elements.

Studies aiming at the discovery of ways and means to standardise switchgear have generally ended in a conclusion that, however desirable, no such ways and means are practicable; sometimes, however, there has been the would-be optimistic supplement "at the present time."

Consciousness of these facts dictates that an explanation of the reasons behind the production of the British Thomson-Houston Company's new "Class Z" switchgear shall preface any description of the apparatus itself. These are, first, to produce a simplified unit design of apparatus in order to reduce costs and assist the progress of standardisation; and secondly, through reduced cost, to render available metal-clad unit switchgear, with its various advantages, to every grade of power distribution and supply business.

Metal-clad switchgear for sub-station use as now made is generally accepted as the best type of apparatus which can be applied to that service, and in many tropical or semi-tropical locations it is the only type which has given satisfaction. It may be said with perfect truth that in many instances where other kinds of gear are used, metal-clad apparatus was excluded solely on account of first cost, that being due to the fact that designs for 6,600 and 11,000 volts, as heretofore offered, have included as a minimum economical size an oil circuit breaker with approximately 100,000 kVA of breaking capacity.



Left: Equipment shown in fig 2; right: Simple equipment with ammeter on circuit breaker.

Fig. 1.—B.T.H. Metal-clad Vertical Plugging Switchgear, Class Z; Two-unit Switchboard.

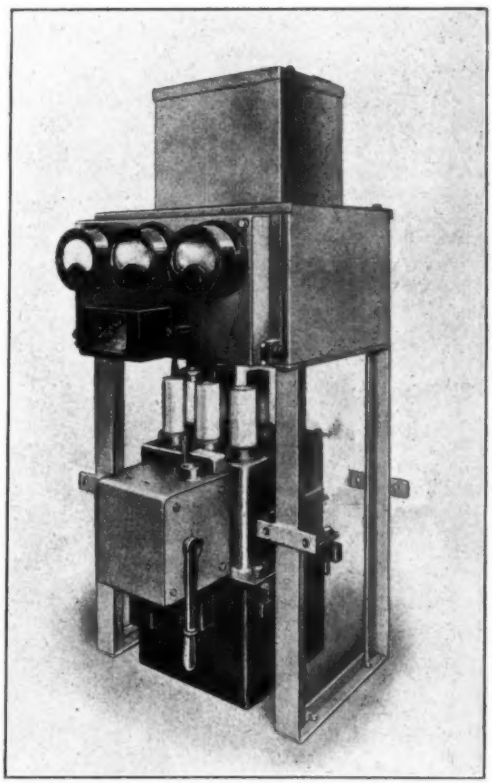


Fig. 2.—Equipment with Hinged Instrument Panel on Fixed Unit and Voltage Transformer on top; Movable Unit Lowered.

There has thus been an unsatisfied requirement for a type of gear with the advantages of compound-filled apparatus, but of such size and design as could be economically employed on systems and circuits of smaller capacity than those now using metal-clad gear exclusively. The cost of such gear must compare favourably

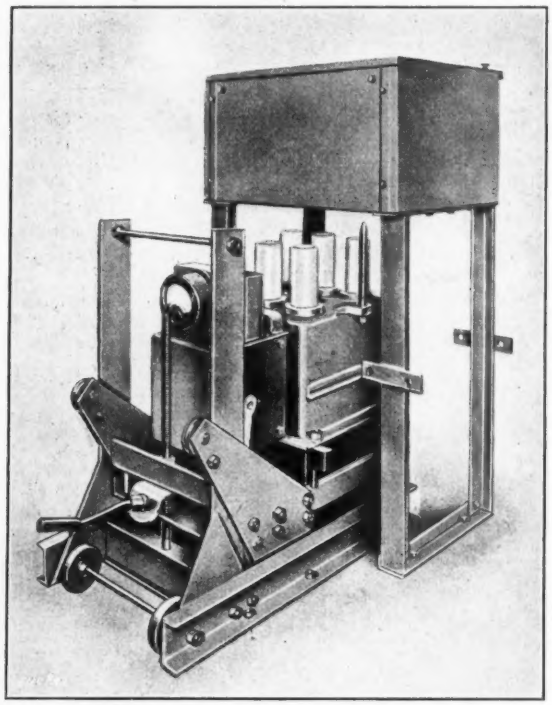


Fig. 3.—Withdrawal Carriage, showing Screw Mechanism for Raising the Movable Unit into Service Position.

with that of the trucks and steel cubicles of corresponding rating which have been heretofore installed, and which it is designed to displace.

The general position has been studied with great care to find what are the essential requirements, and also to see what may be considered the limitations of compound-filled and other designs now available, and the main object kept in view in the design work has been ability to meet the essential requirements and avoid existing limitations in the best possible way with the least possible use of space and material; the standard article can therefore be produced at a low cost. It is hoped that this cost will be found low enough really to influence customers in the direction of standardising their requirements and demands, thus helping them to realise that in the past their own diversity of demand has been one of the most influential factors in keeping up the price of switchgear against themselves.

The following comparative figures applying to similar ratings of typical equipments give an indication of what has been found possible in space saving, and the amounts will doubtless be of interest:—

	Truck gear.	Compound-filled gear.	New "Class Z gear."
Cubic content of space occupied by apparatus	63 cu. ft.	55 cu. ft.	36 cu. ft.
Volume of components	25 cu. ft.	20 cu. ft.	18 cu. ft.
Ratio of space occupied to volume of components	2.5 : 1	2.75 : 1	2 : 1
Floor space covered ...	10.5 sq. ft.	10.5 sq. ft.	7.2 sq. ft.
Floor space to install and operate	23.5 sq. ft.	22 sq. ft.	17.5 sq. ft.

The apparatus is essentially of the metal-clad type, having vertical movement of the breaker to effect isolation of the breaker and circuit from the busbars. It is arranged in the form of units which may be manufactured independently to limits and be interchangeable. Some examples are shown in figs. 1 to 4.

Fixed Chamber.—The standard fixed chamber is arranged to house the busbars and the circuit egress fittings. It is provided with six bell-shaped socket insulators, carrying isolating switches. Internal barriers shut off the busbar contacts from those connecting to the circuit, and each of the chambers so formed is intended for separate filling after erection. Oil is the most convenient material for this purpose, although for 3,300 volts and below, filling may be entirely omitted. The spark-over voltage under test pressure with no filling is well above 20,000 volts.

Each unit is self-contained, and there are no oil-tight or compound-tight joints to make between equipments. The busbars are insulated and pass from chamber to chamber by looping-up over the intervening barriers. When assembled, the busbars are completely shut off from other chambers. By this busbar construction, two points of criticism as applying to existing designs of compound-filled switchgear have been avoided. It has been a source of inconvenience to add equipments at the end of an existing board, because the new busbar chamber could not be placed in position until the existing bus end cap had been removed, necessitating, of course, the shut-down of the bars. In the arrangement adopted, an existing busbar can be kept alive until a new equipment is completely ready for making the bus connection.

The second point has also occurred most frequently on rapidly growing systems, where often a single source of supply exists, and it has been felt that some disability attends the fact that the busbars are hermetically sealed. In this new class of gear, whilst the busbars are completely shut off in metal chambers, they can, nevertheless, be conveniently rendered accessible should circumstances warrant the step.

An automatically-operated shutter closes the contact socket holes when the breaker is withdrawn. Guide holes are provided for accommodating locating spears carried by the oil circuit breaker, so that it is lifted into place in correct alignment.

Circuit Cable.—The circuit-plugging chamber is used also as a cable-sealing chamber, and a wiping gland with armour clamps is provided at the back in a convenient

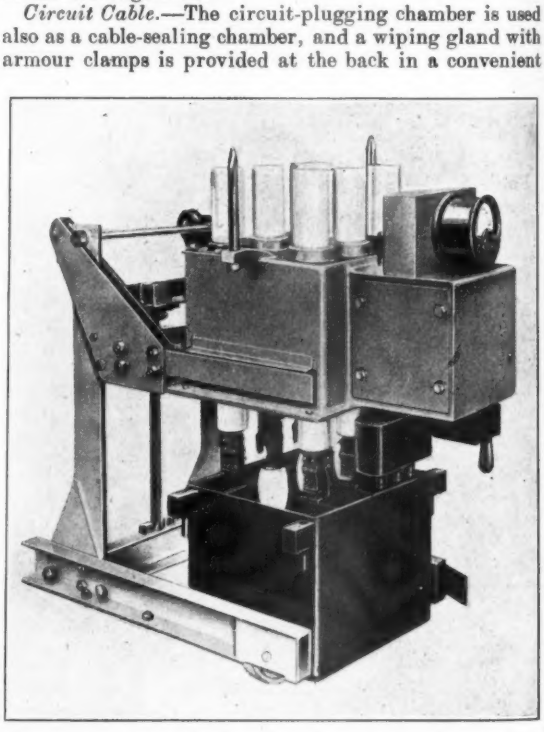


Fig. 4.—Withdrawal Carriage, showing Movable Unit completely withdrawn and raised so that the Circuit-breaker Contacts can be Inspected.

position. For the general case it is assumed that the cable end will be suitable for exposure to oil when it is desired to fill with oil. As indicated, compound may be used alternatively, but where oil filling is required with a cable which is not suitable for oil sealing, an internal sealing chamber is provided.

Pedestals.—These are strong and rigid, and they are pedestals only, in that there are no mechanical slides or guides which might call for precise alignment. They support the fixed chamber on top, and the breaker on projections suitably placed along their height. This support is given through the medium of long rods or bolts which pass under holding lugs on the breaker tank.

Oil Circuit Breaker.—The breaker is of the enclosed type, the mechanism being entirely within the housing. Trip coils are carried in a separate coil case attached below the mechanism. The top of the breaker casing carries six plugging insulators and contacts for engagement with the busbars and circuit.

The chamber above the breaker tank is made rather larger than usual, so that it can accommodate current transformers and at the same time provide an adequate air buffer. The current transformers are air-cooled, and arranged to be very readily interchangeable. They are not exposed to injury from oil or hot gases, their chamber being shut off from the tank.

In addition to the foregoing special features, the characteristics of B.T.H. standard breakers are retained, and the contacts, &c., are of the standard interchangeable type.

The trip coil case will accommodate four coils, one of which is adaptable as a low-voltage release, either self-resetting or suitable for electrical interlock. Time-limit fuses may be mounted on the front of the coil case.

Voltage Transformers.—A standard voltage transformer with protective fuses and limiting resistances is mounted when required on top of the fixed chamber. Contact is made with the circuit connections below, through the medium of spring pins carried on porcelain insulators in the bottom of the transformer tank.

Withdrawal of the fuses through the top serves to isolate the voltage transformer in complete safety, and the top cannot be raised until the transformer is dead from both the primary and secondary sides, and earthed.

Instruments and Relay Mounting.—When a simple equipment such as a feeder requires nothing more than an ammeter, this can be mounted directly on the oil breaker. The wiring to it and to the trip coils from the current transformers is all self-contained in the breaker, and no instrument panel is needed.

For more elaborate instrument equipment a panel is mounted in front of the fixed chamber. It is hinged at the bottom on tubular hinges through which secondary bus wires may be run. The wiring can therefore be inspected and checked with a minimum of trouble.

Current leads are brought from the current transformers in the breaker through a plug and socket joint.

The space in the breaker will accommodate—

(*a*) Three current transformers suitable for operating breaker trip coils and an ammeter at ordinary indicator accuracy up to 15 volt-amperes, or giving wattmeter accuracy up to 5 volt-amperes.

(*b*) Three current transformers giving wattmeter accuracy up to 15 volt-amperes.

(*c*) Two sets of three current transformer cores and secondaries with common primary, the one set giving ammeter accuracy up to 15 volt-amperes, and the other wattmeter accuracy up to 5 volt-amperes.

(*d*) Two sets of three current transformer cores and secondaries with common primary, the one set giving ammeter accuracy up to 15 volt-amperes, and the other wattmeter accuracy up to 15 volt-amperes.

Manipulation.—Hand operation is standard, though solenoid or motor mechanisms can be fitted. A complete but thoroughly simple scheme of interlocking prevents inadvertent mal-operation.

Isolation is effected by lowering the breaker on a simple carriage, which is then withdrawn, leaving the breaker standing on the floor. The breaker can be withdrawn on the carriage for inspection purposes, and to this end the carriage is adapted to pick up the breaker proper out of its tank, when free access may be had to any part of it.

General.—The apparatus is very solidly designed, and its simple form will enable it to be installed out-of-doors with very little addition to the standard equipment. Such addition comprises mainly sheet-steel panels to fill in the pedestals and back, and a door in front to shut off the operating parts from interference.

The fundamental simplicity of the standard equipment is a very strong point in its favour, and one which, it is hoped, will, because of its cheapness, inherently discourage the demand for complications. Duplicate busbars are not normally provided, and in justification it may be observed that two complete equipments of this gear can be supplied at a price no more than is frequently paid to-day for a duplicate busbar equipment with single breaker and selector switches, and that the floor space occupied is also strictly comparable.

As the oil circuit breakers are mechanically interchangeable, two fixed units can be supplied into which one breaker may be plugged alternatively.

Copper-cadmium Conductors.

Experience and test results on the new alloy wire show that it possesses the pliability of annealed electro-copper, the conductivity of hard-drawn copper, and a high breaking strain and resistance to wear.

By A CORRESPONDENT.

(*Concluded from page* 976.)

The electrical engineer of the Winnipeg Electric Railway Co. reports that the maximum wear on the new wire was at a frog approach, and extended for about 3 in.; 24 in. from the wire showed a wear of 5.48 per cent. Generally, the wire on the trial curve showed very little wear except at crossing approaches and at the frogs; this might have been due to the crossings being slightly out of line, and the wear at the frogs may be due to the same cause. As far as can be judged from the time that the wire has been in service, there is no doubt that it pays to install it, especially on curves, in subways, or other places of exceptional wear, due either to the number of cars in service, or to the manner in which the trolley has to be installed. The wire has recently been installed in a subway where there is a total of 870 cars passing over it each day, but sufficient time has not yet elapsed to be able to make statements as to wear. The wire will eventually be used to replace all curves and subway trolley wires as the need arises.

A report by the Superintendent of Power Plants of the Montreal Tramways Co. runs as follows:—"The trial stretch of copper-cadmium wire, which has been installed for about a year, is worn in two places to the size of 1/0 wire. So far as can at present be seen, this wire should last about twice as long as ordinary copper trolley wire."

The McGill University, at which some tests were carried out, reports that copper-cadmium wire has superior wearing properties to pure copper, and that its conductivity averages 92.7 per cent. of the international annealed copper standard. Results show that

the tensile strength of the wire is from 6 to 9 per cent. higher than that of hard-drawn copper, and the conductivity is 3.5 to 4.5 per cent. lower. Regarding the use of copper-cadmium wire on the Continent,[9] the French Government has employed it for several years in all its telephone installations; it does not, however, as is often stated, mix tin with the alloy; it uses a straight copper-cadmium containing about 0.8 per cent. of cadmium. The alloy is prepared in the known manner, and all of the improved properties over hard-drawn copper are recognised by the French authorities. A cadmium-copper-tin wire, containing about 0.5 per cent. each of tin and cadmium, together with traces of other elements, is, however, manufactured in England. The properties are claimed to be superior to P.O. bronze, and to copper-cadmium wire.

Copper-cadmium Rolled Rod.—Some tests performed by Messrs. Nevill Druce for the British Metal Corporation on copper-alloy rods rolled from wire bars to 1-in. diameter bolts, in parallel with ordinary mill practice, may here appropriately be quoted. The compositions of the alloys tested and the test results are indicated in Table VII, from which it is seen that the properties of the alloy bar containing 0.95 per cent. of cadmium are markedly superior to those of the arsenical rod.

Messrs. Nevill Druce themselves comment upon the test results as follows: "Regarding numbers 2, 3 and 4 rolled from the wire bar containing 0.95 per cent. of cadmium, the results are eminently satisfactory. Without the cadmium we should expect this wire bar to give from 13½ to 14 tons per sq. in. tensile strength, whereas by the addition of cadmium, the strength is raised something like 2½ tons per sq. in." The alloy is prepared in two stages, as, besides the heavy loss incurred, an ingot of uniform composition cannot be obtained by direct addition of cadmium to molten copper. An alloy containing from 30 to 75 per cent. of cadmium is first prepared by direct fusion of the constituents; this is analysed and added in calculated amounts to the molten copper. Provided the cadmium be added quickly to the molten copper bath, loss is not excessive, because of the simultaneous reduction of the temperature and fusion point of the alloy. The method of preparation of this alloy is covered by U.S. patent 307,642, 1919. Another[10] method which has been used for the preparation of this "temper" alloy, rich in cadmium for addition to molten copper, involves the use of a special crucible wherein a container for the cadmium is fitted with a tube extending above the level of the molten metal, and down into the molten copper in a crucible beneath. Smith has indicated that this alloy might be suitable for castings for electrical apparatus subjected to wear, but at the same time requiring high electrical conductivity. Rowe, who has conducted researches into this subject, has obtained some interesting results, summarised as follows:—

1. Cadmium exercises a slight de-gasifying effect upon copper.

2. The mechanical and electrical properties of castings with 1 per cent. cadmium melted under a fused cover are good, but the results are hardly so much better as to justify commercial application of the method.

3. The copper castings produced by melting in the ordinary manner and adding small amounts of silicon and 1 per cent. cadmium, are superior in electrical and mechanical properties to those produced with larger amounts of silicon and no cadmium.

4. When using silicon alone, smaller amounts of silicon copper are melted under a fused cover, but the electrical and mechanical properties are not so good as when cadmium is present.

5. The loss of cadmium in remelting copper scrap containing cadmium is small and reasonable in amount.

6. The outstanding feature of the investigation is that copper with 1 per cent. cadmium, and 0.4 per cent silicon, when melted under ordinary conditions, gives sound castings of excellent electrical and mechanical properties. The results are summarised in Table VIII.

TABLE VII.

MECHANICAL PROPERTIES OF ROLLED COPPER ALLOY RODS.

No.	Material	Dimensions of Test.			Tons per sq. in.		% Elong.	Contracted Dimensions.				
		Diam. inches.	Area sq.in.	Length inches.	Max. Load.	Stress inches.		Diam. inches.	Area sq. in.	Redn. %	Cd. %	As %
1	Ingot rolled to 1 in. soft bolt.*	1.004	0.792	4 2	11.58	14.62	54.0	0.65	0.332	58.1	0.26	0.5
2	Rolled from special wire bar to 1 in. soft bolt.*	1.005	0.793	4 2	12.99	16.38	62.0	0.48	0.181	77.2	0.95	—
3	Do.*	1.005	0.793	4 2	12.90	16.27	60.0 78.0	0.49	0.188	76.3	—	—
4	Do.*	1.005	0.793	4 2	12.92	16.29	60.0 78.0	0.48	0.181	77.2	—	—
1	Same as 1 above* ...	0.797	0.499	4 2	7.32	14.67	49.0 63.0	0.48	0.181	63.7	—	—
2	Same as 2 above* ...	0.797	0.499	4 2	8.18	16.39	55.0 69.0	0.37	0.107	78.5	—	—
3	Same as 3 above* ..	0.797	0.499	4 2	8.16	16.35	55.0 71.0	0.38	0.113	77.3	—	—
4	Same as 4 above* ...	0.796	0.498	4 2	8.07	16.20	54.0 70.0	0.38	0.113	77.3	—	—

*Cold bend satisfactory.

TABLE VIII.

SUMMARY OF TEST RESULTS.

No.	Cover.	Cd.	Si.	Y.P.	M.L.	El.	R.A.	Brinell.	Impact.	Conductivity (Copper, 100).
2	Fusible slag -	—	—	3.20	9.82	26	27.6	39.0	14.0	92.5
3	Char. - -	1.00	0.025	5.20	14.46	12	11.5	45.0	14.5	79.0
4	,, - -	0.53	0.025	4.10	11.96	22	19.5	41.2	18.2	81.9
5	,, - -	1.00	0.037	5.96	17.68	16	18.0	45.0	28.0	79.6
6	Fusible slag -	0.15	—	3.30	10.20	30	28.5	37.0	13.5	90.2
7	,, -	1.15	—	4.96	15.30	27	29.6	40.2	20.2	86.2
8	,, -	—	0.025	2.85	10.04	21	23.0	39.8	14.5	87.0
9	,, -	1.15	—	5.40	15.96	18	20.3	40.2	20.0	82.0
10	Char. - -	—	0.250	5.63	14.60	17	16.8	42.0	13.0	55.0
11	,, - -	—	0.100	4.48	11.80	29	27.0	40.0	16.0	73.0

Y.P. = yield poi t; M.L. = maximum load; El. = elongation; R.A. = reduction of area.

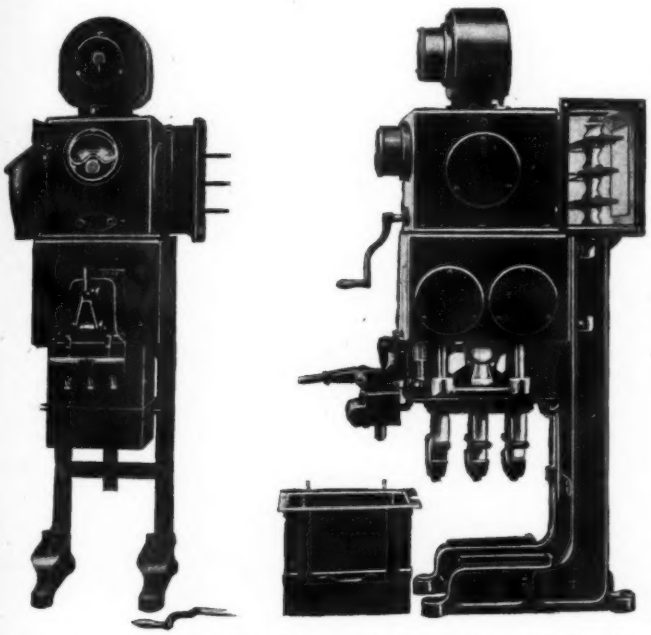
[9]Information provided by courtesy of the British Metal Corp.

[10]Burr, E. G., U.S. Pat. 125,785, May, 1919.

New Vertical Switchgear.

Equipment recently developed by Messrs. J. G. Statter and Co. has the live plug parts completely shrouded, and has been tried out with, it is claimed, complete satisfaction.

A GOOD deal of interest was recently aroused in the electrical world by the publication of particulars of a novel form of draw-out switchgear in which the usual arrangement of isolating plugs is replaced by a frame sliding vertically and carrying with it the necessary conductors in the form of sockets; by this means the switch can be isolated or connected in circuit, as desired, without necessitating any movement of the switch itself. The interest taken in the mechanism suggests that a brief description of another new switch unit of the vertical draw-out type, developed by Messrs. J. G. Statter & Co., may also be of interest. The apparatus has already been put into service and, it is claimed, is giving every satisfaction. Fifteen units of the type shown in figs. 1 and 2 have been supplied to the rubber works of Messrs. Wm. Warne & Co., Ltd., Barking.



Figs. 1 and 2.—Front and Side Views of "Statter" Vertical Switch Unit.

Fig. 3 is a schematic drawing of the plug-in mechanism. The basic idea of the Statter vertical draw-out unit is to get away from reliance on clearances in air—B.E.S.A. or otherwise—and to enclose every live part in a sheathing of porcelain or bakelite. This makes for compactness, since it is only necessary to obtain full clearances in oil, and once these conditions are satisfied for the breaking capacity desired, clearances in air will take care of themselves, at least on a horizontal plane; it is claimed to be unnecessary that porcelain insulators with only a central core of live copper should be spaced apart at the required distances to comply with B.E.S.A. clearance in air.

The usual six plugs are simply the six stems of the oil switch, suitably elongated, of course, and they are sheathed in one continuous porcelain sheathing—see fig. 4—from their "V" contacts in oil to the terminal plug in air, the plug alone projecting beyond the sheathing. The vertical stems are symmetrical about a powerful lifting screw—one screw only—placed at the true centre of the thrust. If the friction per plug could be made equal, then no guides would be necessary: but since, of course, this can never be, guides are provided; these are not shown in fig. 3, but they have only a light duty to perform.

Since B.E.S.A. clearances no longer obtain in a horizontal plane, the six plugs can be nearer together than would otherwise be the case, and a 12,000-V switch has horizontal dimensions unusually moderate. However, as clearances in air have eventually to come in somewhere, seeing that the plugs are inserted and withdrawn in air, B.E.S.A. or greater clearances are provided, but they are in a vertical direction parallel to the axis of the plugs and sockets. Fig. 3 indicates how this makes for compactness.

The one screw is made to do many things: (1) It lowers the switch, tank and plugs, with their current transformers, for the purpose of isolating and for examination; (2) after the tank bolts have been released, it raises the switch out of the oil, so that the under-oil contacts can be examined; but on this journey it does not allow the plugs to be re-inserted—an interlock prevents that. After the tank has been re-fixed the switch can once more be plugged on to the busbars. The screw does all the handling, it is claimed, with ease and accuracy. There is an interlock between the oil

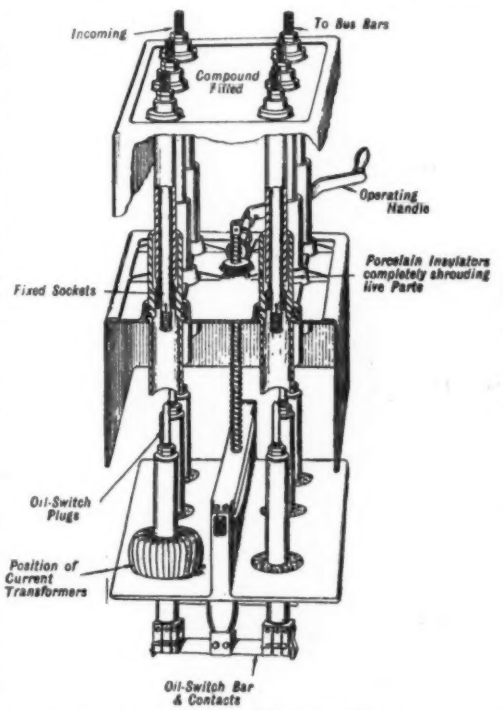


Fig. 3.—Arrangement of New Vertical Switchgear.

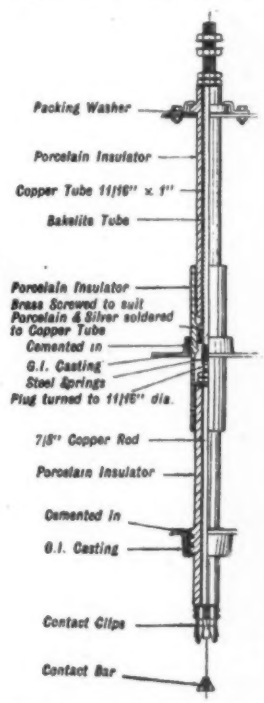


Fig. 4.—Construction of Vertical Stem.

switch and the screw movement, preventing either plugging-in or withdrawing when the switch is closed. Neither this nor the switch operating mechanism is shown in fig. 3, but figs. 1 and 2 will suggest that the plug operating handle (see fig. 3) cannot be revolved whilst the switch operating handle remains in the vertical or "on" position, and it must therefore be horizontal—the "off" position—before the plugs can be moved in or out.

effort in the latter to be communicated to the busbar chamber, see fig. 3.

The following advantages are claimed for the new type of switchgear: It stands out as difficult to improve upon in its compactness; and it requires a minimum of floor space for the following three reasons:—

First, on account of the vertical movement, a virtue common to all vertical draw-out systems; secondly, an advantage peculiar to itself, because the lifting and

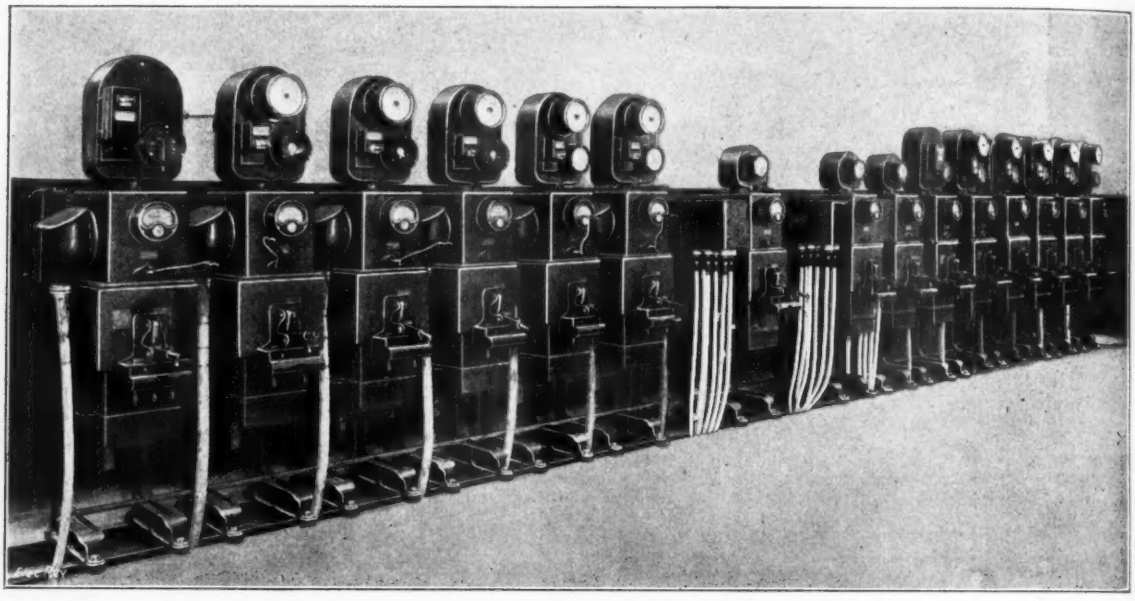


Fig. 5.—Bank of 15 "Statter" Units installed in a Rubber Works.

One current transformer only is shown in fig. 3, in order to indicate how any number up to six can be located outside the porcelain sheath, so as to be quite free from risk of contact with the e.h.p. conductors.

The busbar chamber in the e.h.p. pattern is compound or oil filled. The safety of this chamber is particularly well assured, as there are no fewer than three iron division plates between it and the oil tank, making it next to impossible, it is claimed, for any explosive

lowering mechanism occupies no extra space, but is placed where there would otherwise be a void; and thirdly, because the insulating sheaths sliding one within the other transfer B.E.S.A. clearances from the horizontal to the vertical plane.

It is also claimed to be safe. The pressure drop across the plugs and contacts is under 5 mV at full load, 300 A. Fig. 5 shows the bank of 15 units referred to in the early part of the article.

Our Foreign Electrical Trade.

Origin of Imports and Destinations of Exports, with Figures for 1927 and Previous Years Compared.

WITH the publication of the annual statements of the overseas trade of the United Kingdom in 1927 it is now possible to examine in detail for that period and preceding years the direction of the exports from this country of electrical goods and also the origin of the imports into the United Kingdom of such goods. The annual statements also give a much more detailed classification of the electrical trade than the monthly statements which are regularly reviewed in this journal. It may be recalled that in 1927 imports of machinery and of goods and apparatus showed an advance in value in each of the two groups, the total increase compared with 1926 being £908,000. Exports of machinery showed an advance of £893,000, while exports of goods and apparatus decreased by £1,488,000, this decline being approximately equivadent to the difference between the exports of submarine cables in the two years. The fact is that in 1926 there were unusually large shipments of this class of cable to the United States and Australia. There were other decreases, but none of them was substantial, while shipments of unspecified electrical goods and apparatus showed an advance of £270,000. The net result was a favourable balance in this trade of £12,809,000.

Whereas imports of electrical machinery increased in weight from 4,307 tons in 1926 to 5,920 tons in 1927, the advance in value was from £1,158,647 to no more than £1,597,345. On the other hand, the progress in the export trade in electrical machinery seems to have been accompanied by well-maintained prices, the respective figures in 1926 and 1927 being: weight 34,366 tons and 40,878 tons, and value £5,817,461 and £6,710,817.

The general tendency over the past few years is shown graphically in figs. 1 and 2, the latter indicating at the same time the proportion of the total value of electrical goods and apparatus taken by British countries.

Some leading customers in recent years for our electrical goods and apparatus are shown in figs. 4 and 5. Spain and Egypt might be added, the former with between £200,000 and £250,000 in each of the last three years, and Egypt with £130,000 in 1927.

Of traction motors the exports last year, although above those of 1926 in value, were below the 1925 figure, the totals being: 1927, £495,159; 1926, £487,491; and 1925, £545,632; with weights respectively 2,884 tons, 3,170 tons, and 2,959 tons. It will be seen that

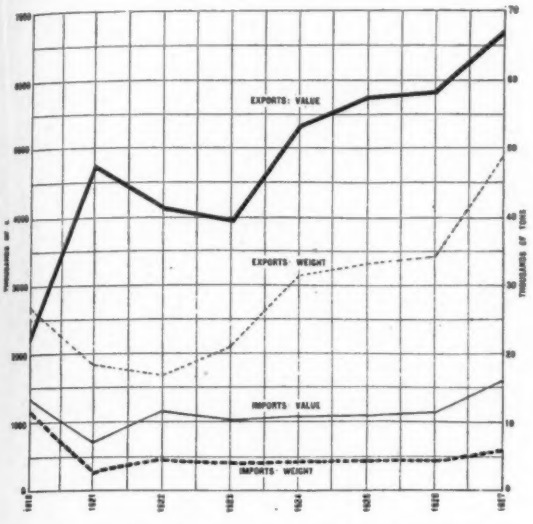


Fig. 1.—Imports and Exports of Electrical Machinery.

in weight exports last year were actually below the 1926 as well as the 1925 figure. The Empire, while still a much better customer than foreign countries, bought less in 1927 than in any year since 1923. On the other hand, Argentine business showed a recovery. The course of the traction motor trade over a period of years is illustrated in fig. 3.

While exports of a.c. motors other than traction were greater in weight than ever before recorded, and greater also in value than last year, they totalled rather less in value than in 1925. Out of the aggregate of £788,000, £598,000 represented shipments to the Empire.

There was a decline in the Empire's purchases of d.c. motors (other than traction), *viz.*, from £520,000

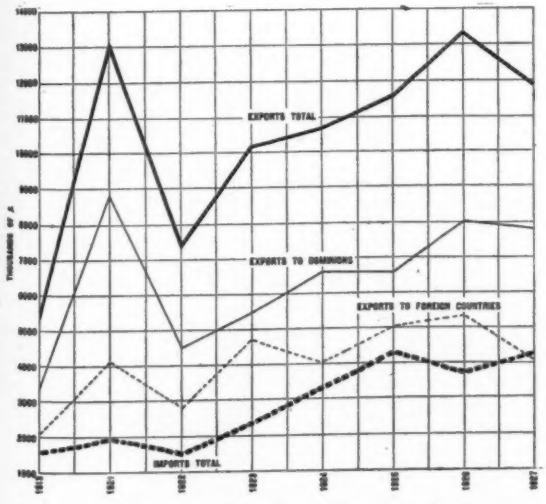


Fig. 2.—Imports and Exports of Electrical Goods and Apparatus.

in 1926 to £472,000 in 1927, but a large shipment to Spain helped to bring the foreign figures to rather more than the level of the previous year.

Our principal customers for generating plant are shown in the following tables:—

EXPORTS OF A.C. GENERATORS.

	1925.	1926.	1927.
		£ (thousands).	
Total	405	557	673
To South Africa	95	58	78
,, India	63	138	80
,, Australia ...	42	49	152
,, New Zealand ...	11	7	18
,, Japan	15	28	105
,, Canada	18	54	48

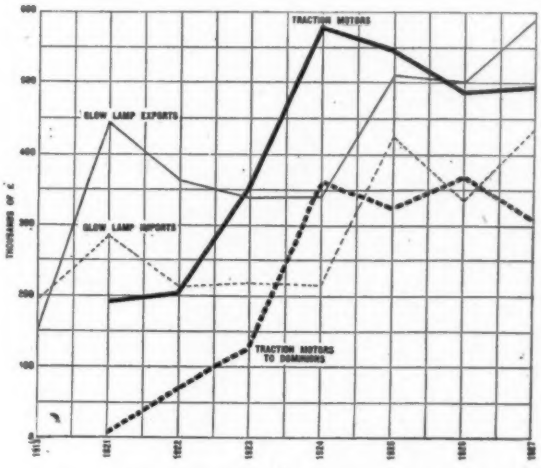


Fig. 3.—Exports of Lamps and Traction Motors.

EXPORTS OF D.C. GENERATORS.

	1925.	1926.	1927.
		£ (thousands).	
Total	392	389	420
To India	81	116	130
,, Australia	60	46	43
,, South Africa ...	22	37	29
,, New Zealand ...	3	17	4
,, Chile	8	19	5
,, Canada	15	20	17
,, Argentina	19	16	26

Our progress in the export of converting and transforming plant is remarkable. Of rotary plant, shipments last year reached £411,500 in value, whereas five years ago they were valued at less than £150,000. For static transformers the figure was £597,000 last year, as against only £259,000 in 1923. Meanwhile imports of convertors and transformers amounted last year to only £43,000.

No less than £1,149,000 is given as the value in 1927 of the exports of "electrical machinery not elsewhere specified," as compared with £919,000 in 1926 and £792,000 in 1925. It would be interesting to have fuller details of the plant included in this large item. As in 1926, more than twice as much electrical ma-

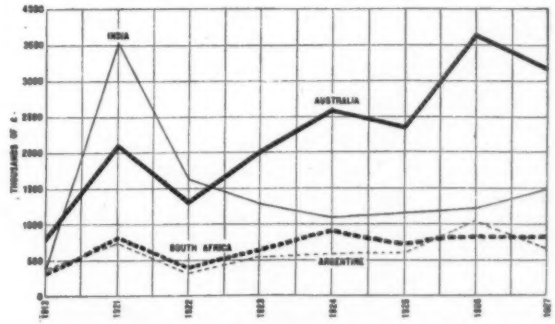


Fig. 4.—Destinations of Exported Electrical Goods and Apparatus.

chinery was exported to British countries as to foreign destinations, the respective values being in round figures £4,600,000 and £2,100,000.

Although there was a decrease of roughly £1,500,000 in the value of the exports of electrical goods and

apparatus, only £208,000 was attributable to any loss of trade with British countries, nearly £1,300,000 being the difference between the value of the exports of such goods to foreign destinations in 1927 and

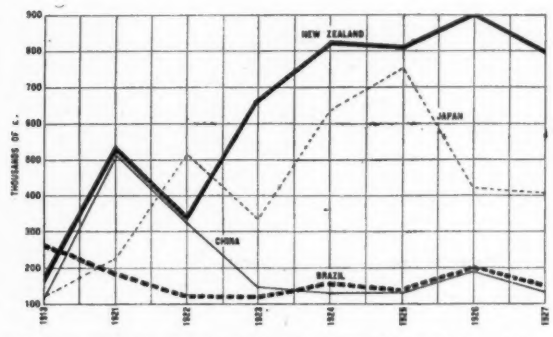


Fig. 5.—Destinations of Exported Electrical Goods and Apparatus.

1926. The British Empire was far and away a more important buyer as a whole than foreign countries of lamps, batteries and accumulators, lighting accessories, instruments, and all descriptions of cables, except submarine, but not for wireless apparatus.

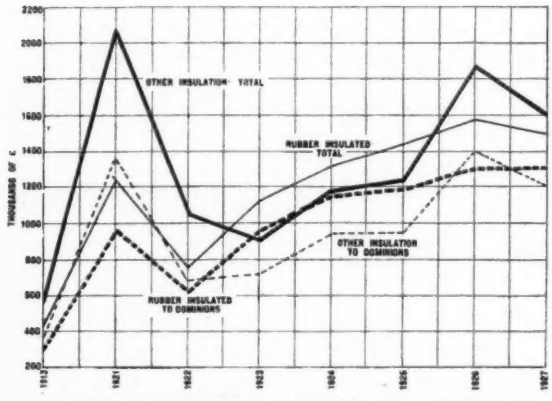


Fig. 6.—Exports of Cable (not Telegraph or Telephone).

The still ascending curve of lamp exports is displayed in fig. 3, which, however, shows that imports last year rose to a greater extent; Holland is still the leading supplier, but with Austria very close behind.

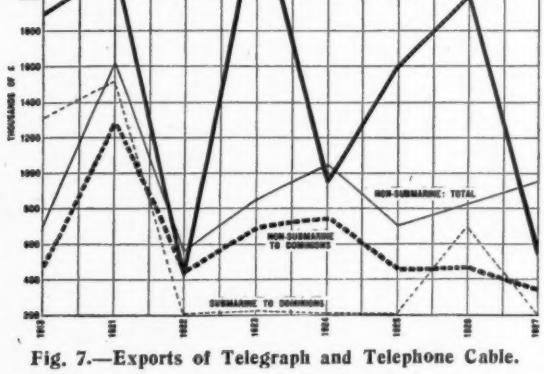


Fig. 7.—Exports of Telegraph and Telephone Cable.

Figs. 6 and 7 show how exports in the cable group, which last year accounted for not far short of one-half of the total exports of electrical material other than machinery, continue to progress. Of rubber-insulated cable, other than telegraph and telephone, about one-third of the value which was sent to British destinations went to Australia, and the same remark applies to nearly one-half of that of cable (not telegraph or telephone) with insulation other than rubber. There was

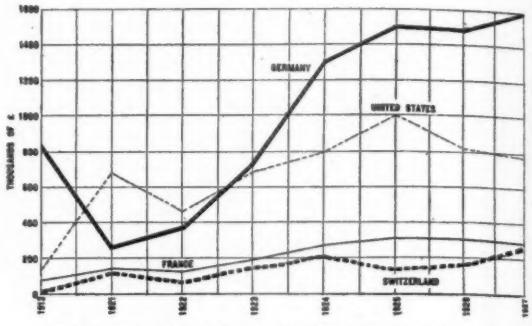


Fig. 8.—Origin of Imported Electrical Goods and Apparatus.

no large shipment in 1927 of submarine cable, while for telegraph and telephone cable, other than submarine, Spain and Mexico figured as large customers.

The overseas trade in radio apparatus is barely maintained. Exports of such material (not including valves) reached £1,000,546 in value last year, against £1,102,000 in 1926 and £1,106,000 in 1925, a decline that may be accounted for by a fall in prices, but at the same time is disconcerting in what should be a growing trade. The main destinations of this material were: British countries, £393,000 (including Australia £144,000, against £247,000, India, £71,000, South Africa £26,000, and the Irish Free State £29,000), and foreign countries £607,000 (including Japan £158,000, Holland £79,000, the United States £30,000, France £42,000, and Argentina £21,000). Of other telegraph and telephone instruments Australia figured largely (with £685,000) as a purchaser, while the Argentine Republic was also a notable buyer (£211,000). On the whole, the foreign group showed a distinct falling off. Exports of radio valves are growing, shipments last year totalling 402,538 in number and £213,000 in value, against £170,000 in 1926 and £183,000 in 1925, with Australia the best customer (£67,000) and then Japan (£39,000).

Figs. 8 and 9 show the chief countries from which our imports of electrical goods and machinery are derived, Sweden, and to a less extent Germany, showing notable increases on last year. Reckoning goods and apparatus as well as machinery, Germany augmented her sales to this country last year by about £180,000, as compared with 1926.

With regard to d.c. motors, which still constitute the

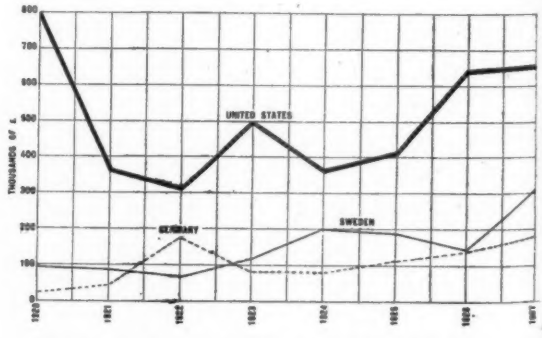


Fig. 9.—Origin of Imported Electrical Machinery.

largest item specified amongst imports of electrical machinery, there is again an increase, *viz.*, to £210,000, compared with £191,800 in 1926 and £132,700 in 1925. The totals for the past three years, together

with the chief supplying countries, are shown below:—

	1925.	1926.	1927.
	£ (thousands).		
Total	133	192	210
From United States ...	69	105	144
" Germany ...	24	19	15
" Sweden	13	5	3
" Holland	8	3	9
" Belgium	6	13	5
" Switzerland ...	3	4	4
" France	—	3	18

Imports of a.c. motors were also substantially greater in value and weight in 1926, *viz.*, 1,065 tons, value £162,800, as against 583 tons, value £88,000, in 1926, and 550 tons, value £78,600, in 1925. Of the 1927 total, £44,700 is credited to Sweden, £68,000 to the United States, and only £8,000, against £15,000 in 1926, to Germany. In the import trade in generators there was a decline on the whole. The value of a.c. machines was only £16,900, against £64,500 in 1926, but d.c. generators were greater in value (at £43,900) than in any year since 1923. The increase in the latter class is to be attributed to the activities of the United States, which accounted for half the total advance in this line.

A new heading has been raised, *viz.*, vacuum cleaners, an item which previously helped to swell the total of electrical machinery "not elsewhere specified." Imports of these articles last year totalled no less than £706,000 in value, of which £232,000 was from Sweden and £202,000 from the United States. Our exports of vacuum cleaners had a value of only £43,000.

In the goods and apparatus group the increase in imports was particularly noticeable in the case of lamps, and batteries and accumulators, an advance of about £100,000 being shown under each of these two headings.

The Radio Manufacturers' Association.

Annual Dinner and Meeting.

THE second annual dinner of the Radio Manufacturers' Association was held at the Hotel Victoria, Northumberland Avenue, S.W., on December 6th, Sir William Bull, M.P. (president) taking the chair.

In proposing the toast of "The Association," Capt. Ian Fraser, M.P., said that the imports of wireless apparatus and valves into this country amounted to £790,000 in 1925, but they had dropped by 40 per cent. to £450,000 in 1927. The number of licences issued in 1925 was 1,500,000, while last year the total had increased to 2,525,000. The export figures were not so satisfactory. Germany had increased its exports of wireless apparatus from £1,125,000 three years ago to over £2,000,000 at the present time, and the United States exports were about £2,000,000 in each of the past few years. British exports remained more or less at £1,250,000.

Mr. A. E. BOWYER-LOWE, chairman of the Association, responded, and said the membership had been doubled during the last year, and now represented 85 per cent. of the radio trade of the country.

Sir WILLIAM BULL, in submitting the toast of "The B.B.C.," said that British broadcasting was gaining in strength and influence, and its margin of superiority over other broadcasting systems was steadily widening.

Sir JOHN REITH, replying, stated that the new dual wavelength station would be in operation by next autumn, and it was anticipated that the regional stations at Manchester, Cardiff, and Glasgow would be completed before the end of 1930. The new headquarters of the B.B.C., at Portland Place, would be completed in from two to three years.

The annual meeting was held on the following day (December 7th). After the formal business had been transacted, Sir William Bull, M.P., was re-elected president. In thanking the Association for this honour, Sir William said that he thought that next year somebody else should be selected for the position. He considered that there were a number of distinguished men from whom to choose, and the Association would gain by selecting one of these. Before proceeding to the election of the new executive council, Mr. Bowyer-Lowe (chairman) moved that the number of members be increased from 15 to 18; this was agreed to, and a ballot for the new council was held. As a result the constitution remained practically the same, the only alterations being the addition of representatives of the British Thomson-Houston Co., Ltd., Burndept Wireless (1928), Ltd., Ferranti, Ltd., and Hart Collins, Ltd., while A. J. Stevens & Co. (1914), Ltd., were not re-elected.

The annual report shows that during the year certain adjustments of membership fees have been made, favouring the smaller members. Reference is made to the royalties question; to the decision to arrange exhibitions in London, Manchester and Glasgow as conditions permit; and to the appointment of Mr. A. E. Moody as exhibition organiser. Members have received sanction to show at a number of exhibitions, including the British Industries Fair and the North-East Coast Exhibition, 1929. Co-operation with other bodies has been furthered during the year, and negotiations with the British Radio Valve Manufacturers' Association have resulted in more favourable terms to set manufacturers. The Association has assisted, through the Radio Trade Committee on Broadcasting, in the preparation of a pamphlet on the maintenance of wireless sets and in a number of other matters. The Association also assisted an I.E.E. committee in drawing up regulations governing the use of battery eliminators. The Association has made an application for an order under the Merchandise Marks Act, 1926, with a view to the marking of imported apparatus, and an inquiry is to be held. A schedule of foreign goods to which Article IV (7) of the Association's constitution has been drawn up and circulated. A local committee in Australia has been formed to advise as to the methods to be adopted to foster British trade in the Commonwealth.

The meeting was followed by a luncheon, at which Sir William Bull, M.P., presided. In the course of the toasts, appreciation was expressed of the chairman (Mr. A. E. Bowyer-Lowe), the vice-chairman (Mr. J. T. Mould), and the officials of the Association.

The Fixed Price Light System.

We have received from the FIXED PRICE LIGHT CO., LTD., Caxton House, S.W.1, an illustrated brochure dealing with the company's services in the Waterloo and Rotherhithe districts, Gillingham, and Poplar. The basis of the scheme in each area is as follows: The company wires, without charge, the premises of small consumers who agree to take a supply on the fixed-price system, and provides distributing mains on the surface of the buildings so that a group of consumers can be supplied from each service. The supply authority runs services to agreed points and supplies the electrical energy required, for which the company pays at agreed rates. The actual development work is thus carried out by the company, and the supply authority receives a secure quarterly revenue without the troubles of collection. It is claimed that the system ensures a good load factor. The weekly charges collected by the company in a typical case run from 4d. to 7d. in the summer, and from 5½d. to 1s. in the winter per lamp, according to wattage. These charges include maintenance and lamp renewal.

The Engineering Industry and Safeguarding.

An article entitled "Engineering Industry and the Safeguarding of Iron and Steel," written by Mr. D. A. Bremner, O.B.E., director of the British Engineers' Association, has been published in pamphlet form by the Association. In this it is shown that the engineering industry is directly interested in the consequences of the "safeguarding" of iron and steel as the consumer of about 30 per cent. of all the iron and steel, home and foreign, used in this country. On the average, it is said, iron and steel represent from 12 to 15 per cent. of the selling value of the products of the industry. Thus the maintenance of that industry, and shipbuilding, is dependent on the existence of a robust, progressive and profitable iron and steel industry. The opinion is expressed that safeguarding would so increase the volume of home production that it would be possible for the iron and steel industry to put its house in order and reduce costs of production to a level that would enable it to meet fair competition.

American Labour and Imports.

The New York correspondent of the *Daily Telegraph* states that the American Federation of Labour is alarmed by the flood of foreign imports, which has put many thousands of men out of work. It has accordingly resolved to petition Mr. Hoover, the President-elect, to call a special session of Congress next year to revise the tariff. In a table our contemporary shows how the imports of certain commodities have risen, in spite of the existing tariff. The list includes electrical machinery which rose from £177,000 in 1920 to £233,000 in 1927. We may supplement this information by pointing out that the value of exports of motors and generators (excluding converting machinery) declined from £4,243,600 in 1920 to £2,333,600 in 1927. In view of the alteration in price levels since 1920 it is probable that the increase in imports is larger and the decrease in exports smaller than the values would suggest, but, so far as electrical machinery is concerned, the balance remains very favourable to the United States.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Christmas Holidays.

We shall be glad if contributors and advertisers will take note that as the Christmas Holidays fall at an awkward time of the week for our printing arrangements it will be necessary to so alter our days of going to press that all news and other matter for the Electrical Review editorial pages for December 28th must be in our hands earlier than usual.

An announcement by our Advertisement Department appears in our advertisement pages, and it is to the following effect:—

Copy and blocks for displayed advertisements to be received at 4, Ludgate Hill, E.C., not later than Monday, December 17th, for the December 28th issue.

Small classified advertisements can be received up to 5 p.m. on Monday, December 24th.

"Electrical Review" Index.

The Index to Vol. CIII (for the half-year ending December 31st, 1928) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.

Recent Contracts.

Messrs. Vickers-Armstrongs, Ltd., have received an order for three sets of endless-rope haulage gears arranged for driving by electric motors. The fleeting wheels are fitted with renewable cast steel treads, and are driven by combined worm and spur reduction gears. The capacity of each haulage is 600 tons at 75 ft. per minute. The three equipments are complete with tension terminals, haulage carriages and enclosed runway, together with the steel haulage ropes.

The English Electric Co., Ltd., has received an order from the Southampton Corporation for six double-deck top-covered 'bus bodies, for mounting on Thornycroft's six-wheeler chassis. The 'bus bodies will be capable of seating 56 passengers, and will be of the most up-to-date construction, and similar to the six 'bus bodies recently supplied by the company to the Portsmouth Corporation.

Messrs. Ruston & Hornsby, Ltd., have received an order from the London Brick Co. & Forders, Ltd., for a "giant" electrically-operated shovel which, the makers say, will be the largest excavator employed in any brickworks in the world. The machine will weigh approximately 380 tons and will carry a 7½ cu. yd. bucket and a jib 90 ft. long. It will deal with 200 tons of clay per hour.

Electric Fires, Ltd. (Norwich), has recently completed a large order for electric water-heater tanks for use in the tropics. These tanks have a capacity of 40 gallons, and a loading of 2 kW. They are of the displacement type for direct connection to a cold water main, and in addition an outlet at the base of the tank is provided to enable hot water to be drawn off irrespective of the incoming cold supply, allowing the energy to be switched off during peak load hours, and the tank to act purely as a thermal storage tank. Heating is provided by immersion heaters fitted in the base and thermostatically controlled. The tanks are of stout gauge tinned copper with teak lagged exterior, and all external pipes and fittings are brightly nickel plated.

Associated Electrical Industries, Ltd.

On December 5th an extraordinary meeting of the shareholders of the Metropolitan-Vickers Electrical Co., Ltd., approved the alteration of the company's name to "Associated Electrical Industries, Ltd.," in accordance with the agreements recently arrived at. Mr. Howard C. Levis, the new chairman, said that proxies representing over 89 per cent. of the possible number had been received in favour of the scheme, whereby the company acquired large interests in the British Thomson-Houston Co., Ltd., the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd. The name of the Metro-Vick Supplies Co., Ltd., the whole of whose share capital the company owned, would be altered to "Metro-Vick Electrical Products, Ltd.," and that company would be the trading company to perpetuate the old name. To enable the board of the company to include representatives of the interests acquired, the whole of the old board had resigned, with the exception of Sir Philip Nash, Mr. Bernard Docker, Sir Edmund Wyldbore Smith, and Lord Wargrave, and in their places the following had been elected: Sir Guy Granet, Gen. the Hon. Sir Herbert Lawrence, Mr. O. H. Smith, Mr. V. H. Smith, Mr. C. F. Spencer, Lord Verulam, and himself (the chairman). The resigning directors would become directors of Metro-Vick Electrical Products, Ltd., and would thus continue to be directly connected with the activities of the trading company. The preference shareholders of the company were to be asked to give the vote to the ordinary shareholders, and by the conversion of the deferred shares into ordinary shares, the large voting rights held by them would disappear. The new arrangements should lead to economies of many kinds, and bring together in a co-operative spirit the staffs of four well-established electrical companies employing nearly 30,000 people.

Big Power Plant Contracts.

The London Power Company has just placed orders for two turbo-alternators for its new power station at Battersea, each of which, with the house service alternators, will have a maximum continuous rating of 67,250 kW. One of these turbo-alternators has been ordered from the British Thomson-Houston Co., Ltd., and the other from the Metropolitan-Vickers Electrical Co., Ltd. These sets, which are claimed to be the largest yet ordered in Great Britain, will be manufactured at Rugby and Trafford Park, respectively. They are designed for 570 lb. per sq. in. gauge pressure and a total steam temperature of 850 deg. F., with feed-heating system incorporated. The alternators will be wound for 11,000 V, three-phase, 50 cycles.

Messrs. C. A. Parsons & Co., Ltd., have recently received an order from the Derby Corporation for a 20,000-kW steam turbo-alternator and condensing plant, while the Bradford Corporation has ordered a 20,000-kW alternator from them. In addition to these contracts, Messrs. Parsons have secured an order for a 10,000-kW turbo-alternator and condensing plant for Saskatoon (Canada).

Further orders for large power plant are foreshadowed in an announcement made last week that the Electricity Commissioners have approved the construction of a new 200,000-kW station at Ironbridge, Salop, on the River Severn, by the West Midland Joint Electricity Authority. This station will be one of the principal base-load stations for Central England, and the plant will consist of four 50,000-kW sets; the total cost is put at £3,000,000. The Commissioners have authorised the borrowing of £700,000 of the £960,000 required for the first stage, which is expected to be completed by the end of 1930.

United States Electrical Exports.

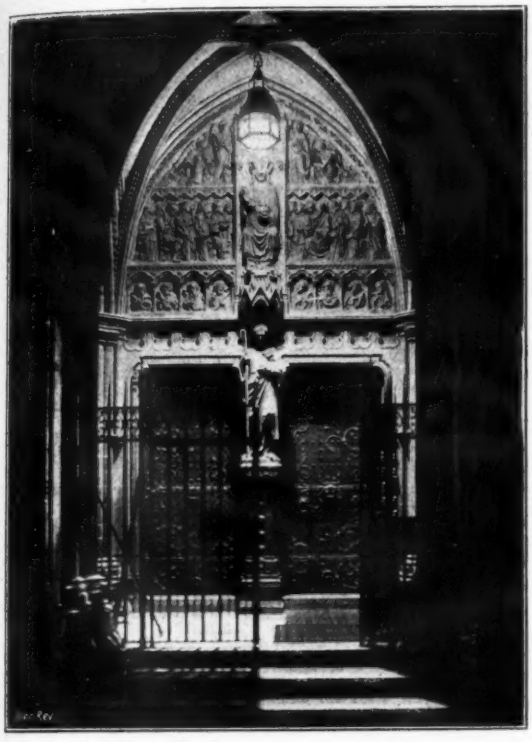
During September last electrical equipment valued at $7,401,387 was shipped from the United States; this compares with $8,252,504 in September, 1927. All classes of generators showed a decrease and exports in this section as a whole fell from $577,204 to $237,638. Another group which recorded a large decrease was "transmission and distribution apparatus" (switchboards, switch- and fuse-gear, meters, &c.), the total falling from $945,297 to $357,051. Exports of "motors, starters, and controllers" (including electric locomotives and portable tools) declined from $1,125,010 to $872,780. In the section "signal and communication devices," there was a rise from $1,378,786 to $1,504,350, radio apparatus increasing from $837,834 to $1,197,248. The most prominent individual increase occurred in the case of refrigeration sets up to one ton capacity—from $284,737 to $467,513. Insulated copper wire and cable advanced from $361,115 to $485,327. The exports for the first nine months of the year were valued at $79,311,174, an increase of $5,058,283 as compared with the corresponding period of 1927. The analysis of the distribution of September's exports shows that Canada was, as usual, the most important customer, her share amounting to $2,729,561. Argentina ($459,856) was next, and then followed Australia ($447,565), Brazil ($389,417), Japan ($318,575), Cuba ($315,794), and the United Kingdom ($282,226). Imports of electrical equipment into the United States were valued at only $271,650, lamps from Japan being the principal item.

A New Belgian Trust.

It is proposed to amalgamate the undertakings of the Société Générale de Chemins de Fer Economiques, the Société Générale Belge d'Entreprises Electriques, and the Compagnie Générale pour l'Eclairage et le Chauffage par le Gaz. The share capital will be about 200,000,000 fr. and the total assets of the combined transport and electricity undertakings in which the three companies are interested in Belgium and other countries are stated to represent 2,000,000,000 fr.

A Cathedral Lighting Installation.

Truro Cathedral is now equipped with an electric lighting installation which harmonises with, and enhances the beauties of, the architectural features of the edifice. Wherever possible floodlighting from concealed sources is employed, and the results are very pleasing. The whole of the scheme was designed by the Illuminating Engineering Department of the



Lighting in Truro Cathedral.

General Electric Co., Ltd., in collaboration with Mr. F. L. Pearson, F.R.I.B.A., Mr. Oswald Swete, and the Diocesan authorities. The installation work was carried out by Messrs. J. H. Deeble & Sons, Falmouth. Our illustration shows how the lighting of one of the porchways throws the stonework into relief.

Electrical Travellers' Dinner-Dance.

A company of approximately 200 ladies and gentlemen attended the dinner-dance held on December 4th at the Hotel Cecil by the Electrical Trades Commercial Travellers' Association. The event was a success in every way, and at the dinner Mr. J. W. Ward, the new chairman, was able to make the very satisfactory statement that out of 150 members only one was unemployed. The London Melody Syncopaters' Band rendered dance music under Mr. T. F. J. May (of Messrs. L. G. Hawkins & Co.). We may mention that the Association renders splendid service in securing employment for its members, giving benevolent assistance when required, and affording special insurance facilities.

Conditions on the Clyde.

The Clyde District Committee of the Electrical Trade Union, in its report to the National Executive, states that trade in the Clyde area can be described as very good from the standpoint of electricians, as there are only a very few members unemployed. The shipyards are particularly bright, and while a continuance of this fortunate position is confidently anticipated during the next few months, it must be borne in mind that some firms are employing an abnormal number of men while others are not carrying their usual quota, with the result that dismissals in one place will only be balanced by the restarts in another.

New Showrooms at Barnet.

The North Metropolitan Electric Power Supply Co., Ltd., has opened new showrooms and offices in High Street, Barnet.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during October last amounted to £72,062, bringing up the total for the first ten months of the year to £410,003, as compared with £310,470 in the corresponding period of 1927.

Calendar.

The 1929 calendar of the BERGMANN ELECTRIC CO., LTD., 82, Victoria Street, S.W.1, consists of weekly sheets, each of which bears an excellent picture of the company's works or products.

Book Notices.

"Marconi's International Register of Telegraphic and Trade Addresses, 1928 and 1929." London: Marconi International Code Co., Ltd. Price 27s. 6d.—This volume, now in its seventh year of publication, consists of some 1,700 pages, and contains information of a kind which cannot be obtained elsewhere. In addition to a representative list of registered cable addresses of the principal firms of the world and a comprehensive summary of the chief codes used by the leading business houses, it contains a trade or business guide devoted to the requirements of those engaged in international commerce. The register is undoubtedly a book for the office of every national and international trader.

"Proposed London and Paris Railway," by W. Collard. Pp. vii+292, and map. London: P. S. King & Son, Ltd. Price 10s. 6d.

"Present-day Developments in Machine Tools," by E. W. Tipple. Reprint of a paper read at the Machine Tool and Engineering Exhibition, Olympia, on September 15th. London: Association of Engineering and Shipbuilding Draughtsmen. Price 2s.

"Données Numériques d'Electricité, Magnétisme et Electrochimie." Pp xi+488. Paris: Gauthier-Villars et Cie. Price 90 fr.

Crompton Parkinson in Australia.

The name of Parkinson (Australia), Ltd., has been altered to Crompton Parkinson (Australia), Ltd. At the same time, the Sydney office of Crompton Parkinson, Ltd., has been taken over by Messrs. Noyes Bros. (Sydney), Ltd., who are to act as sole selling agents in New South Wales and Queensland for Crompton Parkinson, Ltd., in addition to their present sole agency for the associated Australian company.

An Electric Cookery Book.

The REVO ELECTRIC CO., LTD., has produced a useful little booklet primarily for purchasers of its cookers. This contains full instructions in the use of "Revo" cookers; general notes on electric cooking; and numerous recipes and household hints.

The Factory Lighting Campaign.

The Campaign progress report dated December 8th gives brief particulars of a number of lectures given in various parts of the country, including Birmingham, Wednesbury, Newcastle, South Shields, Sunderland, Carlisle, Darlington, Bradford, Wakefield, Barnsley, Bath, Exeter, and Cardiff. Accompanying the report were some notes on a meeting held at the London Lighting Service Bureau, which was attended by owners, managers and works foremen from all over the Greater London area. Mr. R. H. Lingard delivered the lecture, and Lt.-Col. Vignoles, D.S.O., director and secretary of the B.E.D.A., occupied the chair. The visitors showed their interest by asking many questions, and afterwards were conducted round the Bureau and shown the excellent examples of industrial and other forms of lighting displayed there.

The E.D.A. Stand at Cardiff.

In our notes on the recent Engineering Exhibition at Cardiff, we made reference to a stand arranged by the British Electrical Development Association. This stand is illustrated herewith, and, as will be seen, demonstrates the value of good lighting in factories and workshops. In the centre of the stand were a model drawing office and machine shop equipped

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with good and bad lighting separately switched. The stand itself was illuminated in the same dual fashion. Various Campaign posters and examples of lamps completed the exhibit.

Unemployment.

The Ministry of Labour returns for the week ended November 26th show that during the week the total number of registered unemployed rose from 1,364,420 to 1,395,500—an increase of 31,080. The total at November 28th, 1927, was 1,145,250.

Trade Announcements.

The Detrick Arch Co., Ltd., has taken over from the Underfeed Stoker Co., Ltd., all the rights for the design, manufacture and sale of flat suspended arches and roofs and furnace walls constructed under the patent rights of the M. H. Detrick Company in Great Britain and the British Colonies (excluding Canada). It has also acquired the rights of design, manufacture, and sale of "Leco" boiler baffles for the same countries. The operations of the company will be under the management of Mr. J. K. Mann, formerly with the M.H. Detrick Company, Chicago.

The telephone number of the Anti-Vibration Electric Lamp Co., Ltd., is now "Royal 2410."

Messrs. Joseph Pugsley & Sons, Ltd., Bridge House, Lawrence Hill, Bristol, announce that their telephone number has been changed to "Bristol 9389" (three lines).

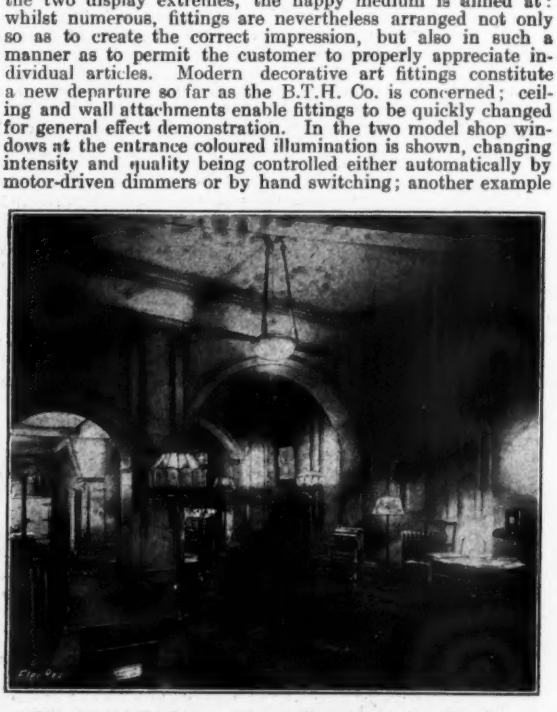
Messrs. Watliff & Co. have removed to their new factory at 175, Merton Road, Wimbledon, S.W.19. (Telephone: Wimbledon 5299.)

Messrs. Tamplin & Makovski, electrical engineers, have carried out considerable extensions to their premises in Brighton Road, Redhill. There is a new showroom, and in the place of the old offices there are an engineer's room, wireless workshop, and a new wireless laboratory.

The offices of the Jackson Electric Stove Co., Ltd., will be closed from mid-day, December 22nd, until the morning of December 27th.

New B.T.-H. Demonstration Room.

Having space available at Crown House, Aldwych, its registered London offices, conveniently situated near what is becoming the hub of the engineering world at Kingsway, the British Thomson-Houston Co., Ltd., has utilised it as a demonstration room for domestic light, heat, power and cooking apparatus, and radio instruments. Supplementary to the company's other showrooms, the comprehensive display is a further contribution towards general electrical propaganda, assisting also the sale of some of the products of the company's 12,000 employés. Such was the explanation of Mr. J. L. Wilson, sales manager and director, at the inaugural luncheon on December 6th. Of the two display extremes, the happy medium is aimed at: whilst numerous, fittings are nevertheless arranged not only so as to create the correct impression, but also in such a manner as to permit the customer to properly appreciate individual articles. Modern decorative art fittings constitute a new departure so far as the B.T.H. Co. is concerned; ceiling and wall attachments enable fittings to be quickly changed for general effect demonstration. In the two model shop windows at the entrance coloured illumination is shown, changing intensity and quality being controlled either automatically by motor-driven dimmers or by hand switching; another example



New B.T.-H. Crown House Demonstration Room.

of the practical exhibition is the spectacular colour illumination of glass skylights in the showroom itself. One of the most interesting exhibits is the "G.E." refrigerator, just placed on the market, which has several attractive features. A special entrance in Drury Lane provides access to the trade counter in the basement below the demonstration room, which serves as a third source of supply for the motor-van delivery service.

Bankruptcy Proceedings.

Nathan Jawett, dealer in electrical goods, 58, Bedford Street, E.—This debtor attended on December 5th, before Mr. Registrar Francke, at the London Bankruptcy Court, for further public examination. He was made bankrupt last July on the petition of the British Thomson-Houston Co., Ltd., in respect of the costs of an action. Mr. Wheeler, Official Receiver, questioned the debtor upon cash and goods accounts ordered by the Court with a view to obtaining the names and addresses of customers to whom he had supplied the lamps which led to the action. The debtor still asserted that he could not give any further information on the subject. He agreed that the lamps were sold at much lower prices than those charged by the petitioning creditors. He further stated that he had a shop, but there was nothing to indicate that he was dealing with a large quantity of lamps. Asked if he made a profit, the debtor replied that he must have done, because he met the business expenses of £6 a week, and took £4 weekly for himself. The cash account showed receipts and payments to the extent of £15,000. There had been a number of accommodation bill and cheque transactions with a Mr. Kaphan, but there was nothing owing to him now in respect of them. He could not give any fuller details of his transactions with Kaphan.

The Official Receiver asked what debtor's object was in accommodating Kaphan to this large extent—out of total payments of £15,000, no less than £8,000 related to accommodation transactions with Kaphan and other people. The debtor asserted that they were mutual accommodation transactions, and were entered into simply to oblige each other.

Replying to Mr. R. T. Sharpe (who appeared for the British Thomson-Houston Co., Ltd.), the debtor adhered to his former statement that he had never imported lamps on his own account, but he admitted that he had authorised someone else to use his name for the purpose of importing them.

His Honour said that he did not believe that the debtor could not give the names and addresses of his customers, and on the ground of failing to disclose his affairs to the satisfaction of the Court, he would adjourn the examination *sine die*.

G. Cohen, electrical engineer, 49, Newman Street, Oxford Street, W.—This debtor attended at the London Bankruptcy Court on December 5th, before Mr. Registrar Warmington, for public examination upon accounts showing total liabilities of £4,445 (unsecured £3,282) and net assets valued at £236, after deducting £204 for payment of the preferential claims. In reply to Mr. Caine, Assistant Receiver, the debtor said that for about nine years prior to 1910 he carried on business as an electrical engineer, latterly in the Hampstead district, and, having incurred losses through bad debts, his uncle provided the necessary money to enable him to pay a composition to his creditors, whose claims amounted to about £1,500. He continued the business at Golders Green Road. After the war he carried on business at 31, King Street, Cheapside, E.C., under the style of the "Reliance Electric & Maintenance Co.," in which he had a partner. After buying out his partner for £50, he continued the business alone, and removed to Queen Victoria Street, and later to Newman Street. In April, 1928, a partnership was registered between himself and his son. In September, 1922, he acquired a lease of shops in Golders Green Road, which he fitted up at a cost of about £600. The debtor attributed his failure and insolvency to bad trade; to heavy overhead expenses; to loss on the transfer of assets to the partnership; to bad debts and to law costs.

Upon the application of Mr. S. B. Child, the trustee, the examination was adjourned till January 23rd.

C. K. Hanbury, 20, Padiham Road, Burnley, Lancs., electrical engineer.—The public examination herein was held recently at the County Court House, Burnley, when the statement of affairs submitted showed a deficiency of £170. The debtor stated that he commenced trading on his own account in July, 1916, his work consisting of wiring houses, mills, &c., and retailing electrical fittings. That business was successful, and in November, 1924, he removed to larger premises. The following year a company was formed to carry on the business, but this went into voluntary liquidation in September, 1926, a dividend of 2s. 3d. in the £ being paid. Later the debtor purchased from the liquidator part of the stock and fittings for £30, and recommenced trading. He was fairly successful until October, 1927, when trade had decreased, and for the last twelve months he had only made a gross profit of about £229. He had kept a complete set of books, and stated that he became aware of his position in August of this year. He attributed his failure to sickness of his family and bad trade. The examination was adjourned.

W. H. Braden, 19, King's Road, Willesden Green, N.W.—The first meeting of creditors was held on December 6th, at the London Bankruptcy Court, a receiving order having been made on November 23rd. According to the debtor's statements he began business in May, 1924, as an agent dealing in wireless goods, and traded in the name of H. Braden & Co., at Balfour House, Finsbury Pavement, E.C. The business paid its way until the general strike in 1926, as the result of which he was forced to close down, having no reserve capital to withstand the trade depression. Eighteen months ago his largest creditor obtained a judgment against him for £795; a judgment

summons was issued last October, and he consequently filed his petition. The liabilities were returned at £1,465, and in the absence of assets the case was left in the hands of the Official Receiver.

H. SAVORY, 7a, Hill Street, Shaw, Lancs., electrical engineer.—Insufficient contracts and keen competition were the causes of failure attributed by the debtor when he appeared at the Court House, Oldham, on December 5th for his public examination. He returned a statement of affairs showing ranking liabilities of £234, against assets of £78, leaving a deficiency of £156. It appeared that he commenced trading in September, 1923, with £260 capital, of which £240 was found by his wife. According to the deficiency account, the profit from trading had only been £53 in the last two years. Debtor said that he had had considerable delay in getting accounts due to him paid. The examination was closed.

E. LANE, 50, Angerstein Road, North End, Portsmouth, electrician.—The public examination herein was held on December 3rd, at the Court House, Portsmouth, when the statement of affairs presented by the debtor showed liabilities of £185. The assets were all absorbed by the preferential creditors. The debtor attributed his failure to heavy domestic expenses and bad trade, and he stated that he commenced trading at Southsea in 1910, with a capital of £200. Six years later he opened a branch at Cardiff, but he had to close it in 1923. The examination was adjourned.

J. W. TURTON, electrical engineer, Market Place, Banbury.—Receiving order made November 29th, on debtor's own petition.

B. H. WISHAW, electrical and wireless engineer, Bakewell Road, Matlock.—First meeting held December 11th, at the Official Receiver's offices, 22, Regent Street, Nottingham; public examination December 18th, at the Court House, Derby.

C. H. DAVIES, electrical engineer, contractor, &c., 6, Stamford Arcade, Ashton-under-Lyne.—Last day for proofs for dividend, December 19th. Trustee, Mr. J. D. Turner, Official Receiver, Byrom Street, Manchester.

C. NICHOLSON, electrical engineer, 3, Lorne Terrace, East Boldon.—First and final dividend of 1s. 8d. in the £, payable at the Official Receiver's office, 14, John Street, Sunderland.

WILSHAW & SHARPE, electrical dealers, 320 Padiham Road, Burnley.—Receiving order made December 3rd, on a creditor's petition.

L. N. BENNETT, radio engineer, late of 23, Carlton Gardens, and East Street, Herne Bay.—Receiving order made December 3rd, on debtor's own petition.

C. H. MARCHANT, electrical engineer, 9, South Street, Tarring, Worthing.—First meeting held December 14th, at the Official Receiver's offices, 12a, Marlborough Place, Brighton; public examination January 16th, at the Court House, Brighton.

W. R. GRIGSBY (Wenham Lighting Corporation), electrical factor, 184, Gray's Inn Road, W.C.—Bankrupt's discharge was suspended on November 9th, for four weeks, expiring December 7th, 1928.

E. SHAW, electrician, 11, Albion Street, Huddersfield.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released November 30th.

B. E. M. POOK, wireless dealer, 53a, Albert Road, Southsea.—Last day for proofs for dividend, December 22nd. Trustee, Mr. J. L. Wilkinson, Official Receiver, 87, High Street, Portsmouth.

H. WOOD, electrical and radio engineer, Market Place, Meltham, Huddersfield.—First and final dividend of 3s. 5½d. in the £, payable December 15th, at the Official Receiver's office, 12, Duke Street, Bradford.

Company Liquidations.

BEDALE & DISTRICT ELECTRIC SUPPLY CO., LTD.—Particulars of claims to the liquidator, Mr. R. W. Smith, Power Station, Bedale, by January 8th.

DIRECT ELECTRIC SUPPLY (BURY), LTD.—A meeting of members is called for January 4th, at 82, Bolton Street, Bury, to hear an account of the winding up from the liquidator, Mr. W. Nuttall.

WEDMORE ELECTRIC LIGHT & POWER CO., LTD.—Winding up voluntarily. Liquidator, Mr. A. Gates, of Messrs. Christy Bros. & Co., Ltd., Chelmsford.

Electrical Christmas Gifts.

Messrs. L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, W.C.2, have sent us copies of "literature" which they have produced for the use of retailers of "Universal" domestic appliances during the Christmas season. These put forward many useful suggestions.

Contractors' Visit to Pirelli-General Works.

The Pirelli-General cable works at Southampton and Eastleigh were visited by between 70 and 80 members of the Southampton, Bournemouth and Portsmouth branches of the Electrical Contractors' Association on November 21st. After inspecting the Southampton factory the party proceeded to the South-Western Hotel, where lunch was served. Mr. G. Martinez (manager of the Pirelli-General Cable Works) presided at the lunch, and supporting him were Mr. H. W. Roberts (sales manager, General Electric Company, Ltd.), Mr. L. C. Penwill (secretary of the E.C.A.), Councillor F. W. Cook (chairman, Southampton Branch E.C.A.), Mr. Knight Bowerman (chairman, Portsmouth Branch), Mr. W. Wilson (chairman, Bournemouth Branch), and Mr. Lyster Holt (Southampton branch manager, G.E.C.). Mr. Martinez and Mr. Roberts extended a welcome to the visitors, and Councillor Cook and Mr. Penwill replied and thanked the company. After lunch the party proceeded to the Eastleigh works, and, later, tea was served in the Sports Pavilion.

For Sale.

Ealing Corporation Electrical Department has for disposal a quantity of surplus plant, including boilers, superheaters, generating plant, &c. The Great Western Railway Co. has for disposal gas engines and dynamos now lying at Swindon. Grimsby Corporation has for disposal two Stirling water-tube boilers, fans, chimney, feed pumps, &c., one 500-kW steam engine and dynamo, switchgear, &c. Basingstoke Corporation Electricity Department invites offers for surplus storage batteries. Salisbury Electric Light & Supply Co., Ltd., invites offers for surplus generating plant, &c. (See our advertisement pages to-day.)

American Radio Patent Decision.

The *Wireless Trader* reports that patent litigation, which has lasted eleven years and probably cost the litigants more than £200,000, has just been terminated by a decision of the Supreme Court of the United States. The decision establishes that Dr. Lee de Forest, and not Major Edwin H. Armstrong, was the original inventor of the regenerative or feed-back circuit. The Supreme Court's decision in favour of Dr. de Forest has a special significance at the present time owing to the fact that further litigation is pending in the States on the question of Dr. de Forest's talking picture rights in the "Phonofilm" process. It is estimated that at least one-half of the radio sets now in use in America embody the "regenerative" or "feed-back" circuit, which makes the three-electrode valve an oscillator or transmitter.

Ruston & Hornsby Awards.

Messrs. RUSTON & HORNSBY, LTD., inform us that at the recent Mysore Industrial Exhibition gold medals were secured by a "Ruston" No. 4 universal excavator and a "Ruston" crude oil road roller.

Swedish Turbines for Russia.

The large Russian power plant recently completed at Volkhov has been equipped with Swedish turbines, delivered by the Swedish Karlstads Mekaniska Verkstads A.G., in co-operation with the Nydqvist & Holm Co., Trolhättan. *Svensk Handelstidning* now states that Russia is negotiating with Swedish turbine manufacturers for additional plant for some new important undertakings, for the construction of which extensive preparatory work is being carried on.

An Electric Sign Exhibition.

A comprehensive exhibition of electric signs was held recently by the Newcastle-upon-Tyne Electric Supply Co., Ltd., at its showrooms at Carliol House, Newcastle. Included in this were a number of "Philips" neon tube signs. The exhibit was arranged in a darkened room. Various backgrounds were provided to enable visitors to judge the effect of the signs under circumstances peculiar to the conditions obtaining at their own premises. Not only advertising signs, but "Philips" tubular neon lighting in red, blue, green and yellow, by means of which both the interior and exterior of buildings can be lighted in a strikingly effective manner, was demonstrated.

Philips's Arrangement with the American G.E.C.

The Amsterdam correspondent of the *Financial Times* reports that the board of Philips Glow Lamps announces with regard to the £129,000 ordinary shares offered to the General Electric Company of New York, that the purpose of this transaction is to obtain the use of the patents and the experience of the General Electric in the sale of the glow lamps in America. The General Electric already holds £463,000 of shares in Philips Glow Lamps, but the latter concern denies that it will ever be dominated by the American company.

Proposed Co-ordination of London Traffic Systems.

It is reported that a meeting representative of seven Metropolitan borough councils held last week passed a resolution protesting against "the proposed surrender by the L.C.C. of the existing public control of the tramways."

New French Company.

A new company has been formed in Paris (1, Rue Taitbout) with the title of La Société des Camions Electriques and a capital of one million francs, with the object of building commercial electric vehicles.

Social Events.

On November 27th, at the Balfour Institute, Liverpool, the A.T.M. Dramatic Society, under the direction of Mr. Thomas Fisher, gave a highly successful rendering of Malthy's comedy, "The Rotters." The acting was exceptionally good throughout. Incidental music was provided by the Strand Orchestra, under the direction of Mr. H. Stranps.

Blackburn tramwaymen held their annual social on December 1st, the Mayor and Mr. J. H. Cowell, tramway manager, attending.

Electricity Meter Approved.

The Electricity Commissioners have approved the construction and pattern of the Ferranti single-phase Watt hour Meter Type "F.C.b." rated from 2.5 A to 110 A, 100 V to 550 V, at 50 cycles frequency.

New Catalogues and Lists.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—An illustrated and priced leaflet advertising the company's "Type 4005" gramophone pick-up and amplifier.

Messrs. E. R. Morton, Ltd., 117, Charlotte Street, W.1.—A priced folder describing and illustrating the "Wirt" radio lightning arrestor.

The Queen's Engineering Co., 60, Queen's Road, Battersea, S.W.8.—Two illustrated and priced leaflets dealing with the firm's motors and generators and battery-charging equipment.

Messrs. Gent & Co., Ltd., Faraday Works, Leicester.—Leaflet 176, advertising "Tangent" combined-wave radio coils, and Leaflet 154F, dealing with the company's power bells and sirens. Illustrated and priced.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—A very full exposition of the principles upon which the "Ferranti" radiant fire is designed, with illustrations and prices of the various models.

The Iron & Nickel Battery Co., Ltd., 17-19, Cockspur Street, S.W.1.—An illustrated folder advertising the company's "Ionic" batteries.

The British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.—Publication L.454, containing illustrated details and prices of the company's projector lamps for use in lanterns of various kinds.

British Insulated Cables, Ltd., Prescot, Lancs.—Publication P.242 (replacing P.217) dealing with aluminium matting, sections, and sheets.

Messrs. Siemens Bros. & Co., Ltd., Woolwich, S.E.18.—Catalogues No. 817, illustrating and describing the company's temperature recorders; and No. 840, dealing similarly with electrical distance thermometers. Priced.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A profusely illustrated brochure dealing with modern style electric lighting fittings employing "Perlique" glassware; and a catalogue containing illustrations and prices of artistic lighting units for the home.

Further December calendar blotters have been received from the Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.1, and Ebonestos Insulators, Ltd., Rollins Street, Canterbury Road, S.E.15.

Messrs. A. C. Cossor, Ltd., Highbury Grove, N.5.—An illustrated and priced folder advertising the company's decorative lamp outfits and receiving set.

Ateliers de Constructions Electriques de Charleroi, 36, Victoria Street, S.W.1.—December stock list of dynamos and motors.

Houghton-Butcher (Great Britain), Ltd., High Holborn, W.C.1.—A folder advertising the "Aeonic" portable five-valve set.

"Movie Ads.," Ltd., 52, Wardour Street, W.1.—A pamphlet advertising the company's industrial and general film production service.

The Wholesale Fittings Co., Ltd., 23, Commercial Street, E.1.—Supplement No. 224, containing illustrations and prices of fittings for commercial and industrial lighting.

Messrs. Richard Johnson, Clapham & Morris, Ltd., Jacem House, Trafford Park, Manchester.—An illustrated and priced catalogue of radio accessories of many makes, and leaflets dealing with "Jacem" fires, saucepans, hair dryers and other domestic appliances.

Electricity Supply Workers' Wages.

Following the rejection of the claim by trade unions representing workers in the electricity supply industry for an increase of 10 per cent. and other adjustments in the wages of those of their members in the industry, modified proposals were submitted at a meeting on December 7th of the National Joint Industrial Council for the Electricity Supply Industry. These were to the effect that the current rates should be stabilised for a further period of twelve months, but that the claims of certain grades should receive consideration. The National Council adopted the proposals, agreeing that its Negotiating Committee should deal with the special claims early in the New Year.

Russian Electrical Imports.

According to figures recently published in *Elektritschestvo*, 65½ per cent. of the electrical machinery and apparatus imported into Soviet Russia during 1926-27 came from Germany. England was second with 10.1 per cent., and then Sweden with 9.4 per cent., followed by the United States with 5.8 per cent, France 3.2 per cent., Austria 2.1 per cent., Italy 1 per cent., and other countries 2.9 per cent. In 1925-26 Germany's share was 49½ per cent., England's 12.8 per cent., and Sweden's 13.5 per cent.

American Radio-Cable Development.

The directors of the Radio Corporation of America have authorised the formation of a subsidiary company to take over its communications business. It is understood in Wall Street that the new organisation will control both the Western Union and the Communications Department of the Radio Corporation. An actual amalgamation of the Radio Corporation with the Western Union is prevented by a Federal Statute, but presumably some arrangement has been reached whereby, in future, both the Western Union and the Radio Communications Department will be controlled as a joint concern.—*Reuter* (New York).

Proposed Canadian Power Deal.

The Shawinigan Water & Power Co. has offered to purchase the Laurentide Power Co., and the directors of the latter company recommend the acceptance of the offer. Two alternatives are put forward. The first provides that the Shawinigan Co. shall give $227.22 in cash for each share of the Laurentide Co.; the second offers $151.67½ in cash, and one and one-tenth shares of Shawinigan common stock for each Laurentide share. Approval must be given before December 29th if the sale is to be carried through.

Escalators for a Liverpool Store.

Electric escalators are being installed at the store of Messrs. Lewis, Liverpool, and when complete in the early New Year will enable people to travel from the basement to the sixth floor. Each escalator can carry 6,000 persons per hour, and is operated by a 20-h.p. motor. The installation is being undertaken by Waygood-Otis, Ltd.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Dec. 11th.	Fortnight's inc or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	8d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/8 to 1/9	...
b	,, Sheet ... ... ,,	1/8 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£203	£11 dec.
	Grade II ... ... ,, ,,	£141	£5 dec.
	Grade III ... ... ,, ,,	£74	£3 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	10½d.	...
c	,, Tubes (solid drawn) ... ... ,,	1/- to /0½d.	...
c	,, Wire, basis ... ... ,,	10¾d.	...
c	Copper Tubes (solid drawn) ... ,,	1/1½	...
c	,, Bars (best selected) ... per ton.	£98	...
c	,, Sheet ... ... ,,	£18	...
c	,, Rod ... ... ,,	£58	...
d	,, (Electrolytic) Bars ... ,,	£75 5s.	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ... ,,	£85 5s.	...
d	,, ,, H.C. Wire per lb.	1 2/d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/3	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India rubber, Para fine ... ... ,,	10½d.	...
i	Iron Pig (Cleveland No. 3.) ... per ton.	75/-	...
i	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£22 5s.	5/- dec.
g	Mercury ... ... per bot.	£22 5s. to £22 15s.	...
e	Mica (in original cases) small ... per lb.	8d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/2½	...
p	,, ,, rolled strip & sheet ,,	1/3½	...
p	,, ,, wire... ... ... ,,	1/4½	...
o	Platinum ... ... per oz.	£15 5s.	1/- dec.
d	Silicium Bronze Wire ... ... per lb.	1½d.	½d. inc.
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£228 15s. to £227 5s.	£11 dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/11	3d. inc.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

In their letter dated December 8th, Messrs. James Forster and Co. state:—The lead market has declined throughout the week, the prices closed at the lowest. The Continental demand has again subsided, and with consumers in this country doing very little, it was not surprising to see values come back to where they stood before the recent rise. Shipments from Australia in November are given as 14,096 tons, so that supplies from that quarter during January should be plentiful, but whether total supplies for that month will be excessive depends upon the Continental demand. The tone in the United States remains firm, and at the moment there is nothing to justify higher prices in London.

Lighting and Power Notes.

Aberdeen.—OPPOSITION TO SCHEME.—The Town Council has decided to oppose the Order promoted by the Grampian Electricity Supply Co., which is seeking to establish an electricity scheme embracing Aberdeenshire, Banffshire, Kincardineshire, and other counties. It appears that the scheme will embrace part of the area supplied by the Corporation Electricity Department, and the objection to the Order is that the Town Council wishes to conserve its rights. The Town Council opposed the Order of the Grampian Company two years ago, when an agreement was made that the company would not penetrate the Council's area.

Ashby-de-la-Zouch.—INQUIRY.—A Ministry of Transport inquiry was held recently into an application by the Leicestershire and Warwickshire Electric Power Co. for sanction to erect overhead lines between Oakthorpe and Donisthorpe. Sir John Turner, a landowner, opposed the proposal on the ground that his partridge shooting would be interfered with. It was stated that the cost of the overhead system ranged from £400 to £800 a mile, and underground cables from £1,300 to £1,850 per mile.

Blackburn.—ELECTRICITY SUPPLY.—The Corporation Electricity Committee has instructed the electrical engineer to prepare a report on the question of supplying electricity to the parishes of Mellor, Balderstone and Osbaldeston. Land is to be purchased in Livesey Branch Road and Revidge districts for the erection of sub-stations. A sub-committee has also been authorised to consider the report on an assisted wiring scheme prepared by the electrical engineer.

Blackpool.—ELECTRICITY EXTENSIONS.—The Corporation has received sanction to a loan of £44,800 for the extension of the electricity supply to Poulton, Carleton and Marton.

Canvey Island.—ELECTRICITY SUPPLY.—The Urban District Council has received from the County of London Electric Supply Co., Ltd., an intimation that electricity will be available on the Island by next autumn.

Clyde Valley.—ELECTRICITY CHARGES.—In connection with the protests that have been made by consumers against the revised electricity tariff, the Clyde Valley Electrical Power Co. has issued the following circular letter: "It is a matter for regret that the new tariff intimated by this company has given rise to misconception. Only a very small minority of consumers who have called at this office and received explanations have left dissatisfied. It is our desire at all times to meet all our consumers in a reasonable way, and accordingly we now intimate that consumers may either continue to take supply on the terms of their existing contracts or may adopt the new rental tariff. Time will show whether the large majority of our consumers will not find it to their advantage to adopt the new tariff."

Continental.—BULGARIA.—The new power station which will supply Sofia was inaugurated on December 2nd in the presence of the King. The station was erected by a Belgian concern.—*Reuter* (Sofia).

ITALY.—No fewer than fifty large hydro-electric power plants are reported to be at present in course of construction in Italy, as a result of which it is estimated the productive capacity of the country will this year be increased by 455,000 kW, by 882,000 kW in 1929, and 283,000 kW in 1930. The majority of the new plants are situated in the provinces of Lombardy, Venezia, and Piemonte, and in the Appennines.

GERMANY.—In order to meet the increasing demand—last year's output being 308 million kWh as against 250 million kWh in 1926—the Hamburg Electricity Supply Co. has recently ordered two new 34,000-kW turbo-generators for its Neuhof power station.

Doncaster.—LOAN SANCTIONED.—The Town Council has received sanction to borrow £3,080 for works required in connection with the supply of electricity to houses on the Intake site.

Dunoon.—ELECTRICITY SCHEME.—A London firm has offered to provide electricity for the district, and the Town Council has given permission for a survey to be made preparatory to the formulation of a scheme. Recently the Council negotiated with Greenock Corporation for a supply by means of a cable across the Firth of Clyde; but a plebiscite of the ratepayers was against the scheme.

Earby.—ELECTRICITY SUPPLY.—The work of laying cables for the Urban District Council's scheme for the distribution of electricity has been commenced. Existing street lamps will be converted from gas to electric lighting as soon as the bulk supply from Nelson is available.

East Ham —ELECTRICITY EXTENSIONS.—At a recent meeting of the Corporation Electricity Committee the engineer reported that in order to meet the demand for electricity during the winter season 1929-30 it would be necessary to carry out extensions and alterations to the generation plant and distribution system as follows: Power station extensions and alterations, £7,635; sub-station at Church Road, £15,070; feeder cables, pilot and telephone cables from power station to Church Road, &c., £6,865. The engineer was asked to obtain tenders for the plant.

Epsom.—NEW PLANT.—The Urban District Council has applied to the Electricity Commissioners and the London and Home Counties Joint Electricity Authority for consent to the extension of the plant at the electricity works by the installation of a second three-phase 50-cycle Diesel set having a continuous rating of 600 kW.

Hornsey.—INQUIRY.—An inquiry was held at the Hornsey Town Hall on December 4th, by Col. T. C. Ekin, Chief Engineering Inspector of the Electricity Commissioners, into an application by the Borough Council for sanction to install a new 5,000-kW Ljungström turbine at the electricity works at a cost of £33,000. Sir Lynden Macassey, K.C., represented the London and Home Counties Joint Electricity Authority; the Hon. Stafford Cripps, K.C., and Mr. Trevor Watson, represented the Borough Council, and Mr. Craig Henderson, K.C., represented the Central Electricity Board. The Electricity Commissioners had referred the application to the Central Electricity Board, the suggestion being that the Board might be in a position to supply Hornsey with the additional electricity it required at a cheaper price than Hornsey could generate with new plant. Negotiations were opened with the Central Electricity Board, which, however, it is alleged, sought to impose conditions which the Council felt would deprive it of rights which it has at the present time, and these negotiations were accordingly broken off. The Hon. Stafford Cripps, K.C. for the Council, pointed out that there was no comparative price to be put against the costs of generation by the Borough Council and that, therefore, he had no case to meet on that point. Incidentally, he reminded the Inspector of the fight that had gone on a few years ago with the North Metropolitan Power Co., whose endeavour to supply Hornsey in bulk had failed on the question of price, and he added that the estimates that Mr. Norman Staniland, the borough electrical engineer, put forward on that occasion had proved to be even more favourable than the figures given at that time. Mr. Craig Henderson, K.C. for the Central Electricity Board, made the offer to supply Hornsey with the additional electricity it required on the basis of a standing charge of £3 5s. per kW per annum of maximum demand, the amount to be paid on 1,400 kW per annum—presumably as a minimum—plus a running charge of 0.22d. per kWh, the last to be increased or decreased in accordance with the price of coal delivered into the bunkers of the North Metropolitan Power Co.'s station. It was added that the Central Board was satisfied that it could supply Hornsey more cheaply than Hornsey could supply itself. The inquiry was adjourned until December 10th.

At the resumption, Mr. H. Hobson, power engineer to the Central Electricity Board, admitted that the temporary supply proposed by the Board would come from the North Metropolitan Power Co.

Mr. Craig Henderson, K.C., for the Central Electricity Board, said that although the Board held the view that these temporary supplies, pending the operation of the grid system, should be given by the Board, in deference to a desire by the Joint Electricity Authority in the present case it would agree to the supply being given by the Authority.

The inquiry was concluded.

Heston and Isleworth.—MAINS EXTENSIONS.—The Electricity Committee proposes laying a new main for the supply of 204 houses to be erected on the Woodlands Estate at an estimated cost of £2,110.

NEW SHOWROOMS.—Sanction is to be sought to the borrowing of £12,700 for the erection of showrooms and offices between Bath Road and Staines Road.

Hull.—SUPPLY TO AERODROME.—The Corporation Electricity Committee has agreed to afford a supply of electricity to the Brough aerodrome, at a cost of £4,498.

Irish Free State.—DUBLIN.—At a recent meeting of the City Commissioners a letter was submitted from the Secretary of the Electricity Supply Board, conveying approval to the expenditure of £106,100 in connection with the Corporation electricity undertaking.

Japan.—HYDRO-ELECTRIC DEVELOPMENT.—The Otamagawa Hydro-Electric Co., Ltd., is the name of a company which has lately been formed at Oura Mura, Ishiki Gun, Fukushima Prefecture, with a capital of £70,000, to establish a new hydro-electric power station. The company has water rights at Akai Mura and Nagato Mura, in Ishiki Gun, on the Otama River. The intake is to be constructed at Takahagi in Akai Mura and the power plant will work under a head of 404 ft. at Nagai, in Nagato Mura.

Lancaster.—NEW PLANT.—The Corporation proposes to install two new boilers at the power station at a cost of £25,000, and a station battery at a cost of £7,500.

London.—SOUTHWARK.—The Borough Council Electricity Committee is applying for sanction to loans of £4,066 for mains and meters and £2,140 for cables.

ELECTRICITY CHARGES.—The Electricity Commissioners have informed the Highways Committee of the L.C.C. that the following standard charges for electricity supplied by the County of London Electric Supply Co., Ltd., have been determined by them:—Bulk supplies, 0.982d. per kWh; street lighting supplies, 1.519d. per kWh; private consumers, an average charge for all supplies of 2.887d. per kWh.

The Westminster Electric Supply Corporation, Ltd., which is engaged in changing over its system of electricity supply from d.c. to a.c., announces that the charge for 230 V a.c. lighting supplies will be reduced to 3½d. per kWh as from the

Christmas meter readings, and consumers changed over after that date will be entitled to the reduced rate as from the date of change-over in each case. The charge for the d.c. lighting supplies will remain at 4½d. per kWh, as at present.

The County of London Electric Supply Co., Ltd., announces that as from January 1st next it will introduce an optional two-part tariff. The charge will be 1d. per kWh for all purposes, plus a fixed quarterly charge. The company is also introducing a hire-purchase scheme.

Middlesbrough.—LIGHTING IN SCHOOLS.—The Education Committee has decided to spend about £1,600 on the installation of electric light in the schools. About a third of the schools are lighted by gas.

Newport (Mon.).—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (general manager, Mr. N. J. Young; borough electrical engineer, Mr. A. Nichols Moore) for the year ended March 31st last, shows a total income of £191,111, and working expenses of £102,578, leaving a gross profit of £88,533. The figures for the preceding year were: Income, £174,934; working expenses, £130,436; gross profit, £44,498. To the gross profit was added revenue from other sources, making a total of £92,256 available, and after payment of capital charges there was a net profit of £29,050, as compared with a loss of £15,483 in the preceding year. The capital expenditure during the year amounted to £107,061, and included £32,298 for mains, £21,322 for services, and £19,277 for land and buildings. The sales of electrical energy increased from 24,705,172 to 28,461,013 kWh, and the maximum supply demanded from 11,030 to 11,350 kW. The average price obtained per kWh fell from 1.596d. to 1.487d. Work was commenced during the year on the extension scheme which comprises an extension of the boiler house with two boilers, an additional 10,000-kW turbo-alternator, and the river pumping station. Good progress was made in connection with the assisted wiring scheme which was inaugurated in the preceding year, and the total installations connected as at March 31st was 2,278.

Preston.—ELECTRICITY IN BULK.—Further provision is being made for the bulk supply of electricity from Preston to Blackpool. Already there are two transmission lines from the Ribble power station to Blackpool. It has now been decided, to lay two additional lines along the existing route. The cost of this extension is £103,000 and it will be shared by the two Councils. The scheme has been approved by the Electricity Committees of the two towns and now awaits the ratification of the respective councils.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SPENBOROUGH.—Lighting: From 6d. to 5½d. per kWh. Public lighting: From 3d. to 2d. per kWh. Power: From 3d. to 1½d. per kWh.

CHESTERFIELD.—Supply to kinemas and theatres between April and September: 2d. per kWh.

LOUGHBOROUGH.—Lighting: From 6d. to 5½d. per kWh.

Retford.—LOAN.—The Town Council is applying for sanction to a loan of £6,000 for the electrification of the rural area.

Special Orders.—Application has been made to the Electricity Commissioners by the Trent Valley and High Peak Electricity Co., for a Special Order authorising it to supply electricity in the rural districts of Hayfield and Glossop Dale.

The Minister of Transport has confirmed a Special Order made by the Electricity Commissioners authorising the Woodstock Power Syndicate, Ltd., to supply electricity in the borough of Woodstock and the parish of Hensington Without.

In connection with the East Nottinghamshire Electricity Special Order, 1928, a Select Committee of the House of Commons has proposed an additional clause applying the provisions of Section 18 of the Schedule to the Electric Lighting (Clauses) Act, 1899, for the protection of the Butterley Company, Limited, and of the Bolsover Colliery Company, Limited, and their respective electric lines, as if each of the two companies were a body or person supplying energy in pursuance of the principal Act, and as if such electric lines had been placed under the powers of that Act.

Stretford.—LOAN.—The Urban District Council Electricity Committee is to apply for sanction to borrow £21,000 for l.p. mains and services.

NEW PLANT.—It was reported at a recent meeting of the Committee that specifications were in hand for additional transformers which will be required at Ashburton Road and Trafford power station, and plans were also being prepared for a new sub-station in Trafford Park.

Tain.—ELECTRICITY SUPPLY.—An offer of 50,000 kWh from the Ross-shire Electric Supply Co., Ltd., on the understanding that the company agrees to provide any increase necessary following 12 months' notice, has been accepted by the Town Council.

Tamworth.—LOANS SANCTIONED.—The Town Council has received sanction to loans totalling £13,271 for electricity purposes.

Torquay.—PROPOSED PURCHASE OF UNDERTAKING.—The Corporation has received an intimation from the Teignmouth Electric Lighting Co., Ltd., that it is prepared to sell the Buckfastleigh electricity undertaking to the Corporation for the sum of £12,500. The Electricity Committee, however, suggests that the price be decided by arbitration. The Committee proposes, therefore, that counsel be engaged, if necessary, to advise the Corporation in the matter, after consulting with its Parliamentary agents.

The Electricity Committee is to give a supply to the Co-operative Society's mills at Buckfastleigh for a period of seven years, the estimated cost of the scheme being £6,150.

SUPPLY TO MARLDON.—An electricity supply to Marldon is to be switched on on Christmas Eve, and the borough electrical engineer (Mr. H. F. Woods) has arranged an electrical exhibition.

ELECTRICITY SUPPLY PROGRESS.—The generation of electricity at Newton Abbot since March 31st last amounts to approximately 7,800,000 kWh, an increase of over 1,500,000 kWh, as compared with the corresponding period of last year.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical World*, an application has been filed by the West Texas Utilities Company with the Texas State Board of Water Engineers for a permit to impound 2,500 acre-feet of water annually on Lytle Creek, near Abilene, to provide water power for a hydro-electric plant which it desires to construct at a cost of $5,000,000. The new plant will be about a mile and a half from the present dam, which is two miles east of Abilene, and will be the largest owned by the company, with three units developing 20,000 h.p. each. If the permit is granted, work will start on the dam next fall and the plant will be erected in 1930.

Walsall.—EXTENSION OF SUPPLY AREA.—The Corporation Electricity Committee has recommended that, in order to give a supply of electricity in the Little Aston area, mains be extended at a cost of £3,100.

West Midlands.—NEW POWER STATION.—At its meeting on December 7th the West Midlands Joint Electricity Authority decided to proceed immediately with the construction of the first section of the new power station at Ironbridge, at a cost of £700,000. The Electricity Commissioners have given their consent and sanctioned the borrowing by the Authority of this amount provisionally, though the cost of the first section is estimated at £960,570. The overall cost of the complete undertaking will be nearly £3,000,000. The station, as originally projected, was to contain plant with a total capacity of 160,000 kW, chiefly consisting of 20,000-kW sets, but the requirements of the Central Electricity Board for Central England necessitate the installation of sets of 50,000 kW, and it is now considered that four of these will be required. The first section, on which an immediate start is to be made, is for the first of these sets. It is anticipated that the first section will be completed towards the end of 1930 or early in 1931.

Wimbledon.—LOANS SANCTIONED.—The Corporation Electricity Committee has received sanction to the following loans: Mains and services, £100,000; wiring installations, £5,000.

Worthing.—ELECTRICITY SUPPLY.—The Town Council has applied for sanction to a loan to supply electricity to Ferring. It is proposed to extend the e.h.p. cable from the present termination in Goring Lane to a sub-station at Ferring. From that point approximately 7,000 yards of l.p. cable is to be laid for distribution purposes. The estimated cost of the extension is £9,680. It is also proposed to extend the supply to Findon, at an estimated cost of £11,043.

Tramway and Railway Notes.

Birmingham.—NEW TRAMWAY.—Powers are being sought by the Corporation for the construction of a tramway in Summer Road and along a new street to be constructed at Erdington.

Canada.—DIESEL-ELECTRIC LOCOMOTIVES.—A new oil-burning locomotive driven by a combination of Diesel engine and electric dynamo just introduced by the Canadian National Railways in Ontario is the largest of its type in the world. A water boiler acts as an exhaust silencer and, at the same time, as central heating plant for the whole train. The exhaust gases diverted into the boiler are claimed, even when the thermometer is 12 degrees below zero, to be sufficient to maintain a comfortable temperature in the coaches of an average train. The new locomotive is in two units, each fitted with a 12-cylinder Diesel engine of 12-inch bore and 12-inch stroke; duplicate controls are provided at either end. The complete engine weighs 650,000 pounds and is capable of hauling a train of 2,800 tons at an average speed of 40 miles an hour. It carries 16,000 pounds of fuel oil, 22,000 pounds of water, 6,000 pounds of sand, and 2,000 pounds of lubricating oil, sufficient for 12 hours' continuous operation. The modified Diesel engines are being manufactured in this country by Messrs. William Beardmore & Co., Ltd., Glasgow.

Continental.—SAN MARINO.—The first stone was laid on December 3rd of an electric railway which is to be constructed between the Republic of San Marino and Rimini, a distance of 10 miles.

London.—NEW STATION AT EALING.—Ealing Common station on the District Railway is shortly to be demolished and rebuilt on up-to-date lines. As in the case of all modern underground station rebuilding schemes, the new building will resemble those on the Morden line. The station will have a frontage of 60 ft. and the exterior will be floodlighted. The booking hall will have a total area of 1,800 sq. ft., as compared with the present area of 400 sq. ft.

Two new escalators were put into service at Charing Cross on December 4th. These run from the street level (Villiers Street) to the intermediate landing below the District Railway tracks. From this level other escalators serve the Bakerloo and Hampstead tubes, so that passengers can now travel between street and train without having to negotiate any fixed staircases. There are now eight escalators at this station.

Manchester.—TRAMWAY RECONSTRUCTION.—The Corporation Tramways Committee is to reconstruct the lines and overhead equipment of the Heywood tramway at a cost of £19,000.

Newport (Mon.).—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager, Mr. N. J. Young; tramway engineer, Mr. A. Nichols Moore) for the year ended March 31st last show a total revenue of £102,303, as compared with £95,110 in the preceding year. Working expenses amounted to £78,750, as against £75,871, leaving a gross profit of £23,553 (£19,239), to which was added revenue from other sources, making a total of £28,248, but after providing for capital charges and permanent way renewals there was a net deficit of £2,322, as compared with a loss of £7,390 in 1926-27. The capital expenditure during the year amounted to £29,450, the bulk of which was spent on permanent way. The number of passengers carried increased from 14,805,270 to 16,028,051, and the car miles run from 1,202,510 to 1,315,536. The revenue per car mile fell from 18.982d. to 18.663d.

Salford.—'BUS COMPETITION.—The *Manchester Guardian* reports that a circular letter has been issued to members of the City Council in which it is stated that the Tramways Committee is seriously concerned at the loss of revenue of the undertaking, due to the fact that local authorities in districts in which the Corporation runs tramcars are licensing proprietors of motor-omnibuses to run in competition with the tramways. The General Purposes Committee proposes to promote a Bill in the present session of Parliament requiring local authorities to obtain the consent of the Minister of Transport before issuing licences to omnibus proprietors to run in competition with the Corporation tramway system.

United States.—NEW YORK.—The *Electric Railway Journal* reports that plans for the operation of the major part of the Manhattan lines of the new city subway system in New York to begin early in 1930, have been announced by the Board of Transportation. Provisions for passenger transfer facilities with lines of the Brooklyn-Manhattan Transit Corporation and the Interborough Rapid Transit Company at seven points in Manhattan reflect the influence of the unification negotiations now pending with the B.-M. T. and take into consideration also possible recapture of I. R. T. lines. Negotiations for power supply have reached almost their final stage. The city plans to begin operation with express service from 207th Street and Fort Washington Avenue to a temporary terminal at Church and Chambers Streets, and a local service from Broadway and 168th Street to the same temporary terminal. The Manhattan section of the new city system will run along the west side from Fulton Street to 211th Street and Fort Washington Avenue, linking with the line to Queens.

Warrington.—DOUBLING OF TRACK.—The Corporation Tramways Committee proposes to double the tramway track from Glazebrook Street to the cemetery terminus.

Telegraph and Telephone Notes.

Beam Radio-telegraphy.—AUSTRALIAN SERVICE.—The number of paid words handled by the Post Office beam service in both directions between this country and Australia averages between 180,000 and 200,000 a week, says *The Times*, which explains that about 17,000 paid words have been transmitted from Australia by the beam service and about 10,000 by the Post Office Imperial cables in connection with the first cricket test match.

Bolivia.—TELEGRAPHY.—The South American Republic of Bolivia, with a population of 2,599,000, has now 7,150 miles of telegraph wires and 3,589 miles of telephone wires in operation.

Canada.—WIRELESS TELEPHONY.—Wireless telephony is to be extensively used in British Columbia to supplement the wire telephone services in outlying districts to which it is economically impossible to extend existing telephone lines. A charter will be sought at the next session of the Provincial Legislature for a company to enter the radio-telephone field and be subsidiary to the British Columbia Telephone Company. The proposed wireless service will work in conjunction with the existing telephone service.—*Reuter* (Vancouver).

China.—TELEPHONY.—Preparations are being made by the Chinese authorities for the installation of a long-distance telephone service between Paoshan and Tachangchin. The proposed line will be 26 miles long and will connect all villages within the limits of the Paoshan District.

HUPEH.—Long-distance telephony in the Hupeh province is projected. According to the *Chinese Economic Bulletin*, the lines will total 8,400 miles in length and cost over $500,000: one 800-mile line will connect Hankow and Ichang, *via* Shasi, and one of 750 miles will connect Hankow and Yungyang, *via* Hsiangyang.

Germany.—"CONFERENCE" TELEPHONY.—The German postal authorities are experimenting with apparatus designed to permit the simultaneous connection of several telephone subscribers for the purpose of general discussion, says *The Times*. It is believed that such an innovation would be of value in enabling important matters to be discussed at short notice without the necessity for an assembly of the persons concerned. The various subscribers would be connected at the telephone exchange, and each would address his remarks to a microphone, by which they would be transmitted through the telephone line to the loud-speakers of his listeners.

Hull.—TELEPHONE PROFIT.—The Corporation Telephones Committee reports a surplus of £7,010 for the half year on the municipal system.

International Telephony.—TRANS-BALTIC SERVICE.—Telephone communication between Sweden and Lithuania was inaugurated on December 1st. The first conversation took place between the Stockholm and Kovno telegraph agencies. —*Reuter* (Stockholm).

GERMANY-TO-ARGENTINA.—A wireless-telephone service between Berlin and Argentina was to be opened to the public on December 10th. At first the service will be confined to Buenos Aires on the one side, and Berlin, Hamburg, and Frankfurt on the other, between the hours of 3 and 6 p.m.

Italy.—AUTOMATIC TELEPHONY.—A new Swedish-made automatic telephone exchange has recently been installed in Naples. It at present serves 8,500 subscribers, but when fully built out will have a capacity of 80,000 lines.

Northern Ireland.—WIRELESS COMMUNICATION.—At a meeting of the Belfast and District Chamber of Trade last week the isolation of Northern Ireland by the cutting off of telephone and telegraph communication on two occasions during recent storms was referred to by the president, Major J. T. Duffin, M.C. Mr. D. E. Lowry moved that the Chamber should urge the Government of Northern Ireland to approach the Imperial Government with a view to emphasising the importance of the installation of a supplementary wireless service between Northern Ireland and Great Britain so as to avoid a repetition of such interruptions. Mr. S. D. Bell, J.P., seconded the resolution, which was carried unanimously.

Peru.—WIRELESS TELEGRAPHY.—The new wireless station (OAX) opened near Tumbes, in the most northerly administrative division (Provincia Litoral) of Peru, bordering on Ecuador, is the fifteenth to be erected in the Republic; it forms part of the Government communication system and compares in power with the stations at Lima and Callao, which have a range of about 1,000 miles. A receiving wavelength of 600 metres is used with transmission waves of 600, 1,500, 3,000, 3,500, and 4,000 metres.—*Reuter's Trade Service* (Lima).

Radio at Sea.—OPERATORS.—The Merchant Shipping (Wireless Telegraphy) Rules Amendment Rules (No. 2), 1928, dated November 15th, 1928, made by the Board of Trade under the Merchant Shipping (Wireless Telegraphy) Act, 1919 (9 and 10 Geo. 5, c. 38), which comes into force on January 1st, 1929, provides that the following shall be substituted for paragraph (*a*) of Rule 15 of the Merchant Shipping (Wireless Telegraphy) Rules, 1927 (*a*), *viz.*: "(*a*) A first-grade operator is one who holds the Postmaster-General's first-class certificate of proficiency issued under the provisions of the International Radiotelegraph Convention (London), 1912, or the Postmaster-General's first- or second-class certificate of proficiency issued under the provisions of the International Radiotelegraph Convention (Washington), 1927, and who has had three years' experience as an operator at sea, of which period two years shall have been in a ship where fixed hours of watch are kept."

Turkey.—AUTOMATIC TELEPHONY.—A new automatic telephone exchange of Swedish manufacture, having an ultimate capacity of 2,000 lines, was recently inaugurated at Smyrna.

Uruguay.—TELEPHONE SYSTEM.—A plan has been submitted to the executive for the modernising of the whole telephone system of Uruguay, estimated to comprise 23,800 subscribers (16,250 in the Montevideo city area). Tenders will probably be invited early next year, unless the work is entrusted to the contractors who carried out important extensions last summer, when long-distance connections were completed with Santiago-de-Chile.—*Reuter's Trade Service* (Montevideo).

Radio Notes.

Austria.—High-Frequency Interference.—In a Bill shortly to be brought before the Austrian Parliament there will be clauses making punishable the use of high-frequency apparatus for massage or other purposes in such a way that the reception of radio broadcasting is interfered with.

Canada.—Commission of Inquiry.—It is announced in Ottawa that the Commission which has been appointed to investigate radio problems and broadcasting methods consists of Sir John Aird, president of the Canadian Bank of Commerce, Mr. C. A. Bowman, editor of the *Ottawa Citizen*, and Mr. Augustin Frigon, director of the Polytechnic School in Montreal. The Commission is to visit England and Europe.

Regional Broadcasting.—Sheffield Station.—A deputation representing the Sheffield City Council, the Cutlers' Company, the Sheffield University, the Chamber of Commerce, and the Education Committee was assured last week by the B.B.C. that when the regional station is erected on the Pennines, Sheffield listeners using reasonably efficient crystal sets will be adequately served. The regional station will not be in operation till 1930, and until then the Sheffield station will be retained. If it is then found that reception signal strength in Sheffield is not adequate, the local station will be kept in operation.

United States.—Picture Broadcasting.—It is announced that a company, with a capital of ten million dollars, has been formed to manufacture and sell broadcast picture receiving sets for installation in private houses. Programmes of still pictures have been broadcast from a number of New York stations for the past six months.—*Reuter* (New York).

According to *Science*, amateur radiovision enthusiasts will soon be able to receive from 21 stations operated by 11 different broadcasters. Nine are now broadcasting, while two have their stations under construction; several others have applied to the Federal Radio Commission for authority to enter this field, but so far have neither been granted licences to operate nor construction permits. Included in this number are three of the chief manufacturing firms. The Radio Corporation of America, in New York City, has three bands of 100 kilocycles width each; one is now in use. The General Electric Company, at Schenectady, N.Y., is regularly broadcasting at three different frequencies, including 790 kilocycles, that of the WGY broadcast station; all of 10-kilocycle widths. The Westinghouse Electric and Manufacturing Co., of Pittsburgh, Pa., has been assigned two bands of 100 kilocycles width, at wave-lengths of 63 and 150 metres: the former is now in use on an irregular experimental schedule. Though the Federal Radio Commission has recently issued a new order regulating radiovision broadcasting, it does not affect the present situation very greatly. One of the chief points is that it may be done freely, though with the necessary approval of the Commission, at frequencies above 1,500 kilocycles, or wave-lengths below 200 metres, the lower limit of the broadcast band. Radiovision broadcasting at frequencies between 550 and 1,500 kilocycles, the present band of the broadcast stations, will be permitted with certain limitations: one is that no band wider than 10 kilocycles may be used for the purpose, it shall not be used more than one hour each day, and not between 6 and 11 p.m., in order not to interfere with broadcast telephone listeners. All the present radiovision broadcasters are now using the shorter wave-lengths, except stations WGY, WRNY, WCFL, and WIBO. None has bands wider than 10 kilocycles, as that is the width of all sound broadcasting bands; only WRNY has been broadcasting radiovision in the evening hours, but the Radio Commission has announced that there will be further reallocation of radiovision bands.

The Radio Manufacturers' Association recently adopted as standard the 48-line, 15-picture-per-second method, scanning across the frame from left to right and top to bottom, as one reads the pages of a book in English. With the 100-kilocycle band that will be used in the future, ten times the width used by many present broadcasters, it will be possible to send considerable detail.

Short-wave Operation.—Signal Echo.—Members of the Poynting Physical Society of the University of Birmingham were addressed recently by Prof. E. V. Appleton (Professor of Physics, King's College, London) on "Some Wireless Methods of Investigating the Electrical Structure of the Upper Atmosphere." What was the shortest wave-length which the Heaviside layer would reflect back? he asked, according to the *Birmingham Post*, for it was thought that with waves of five metres or less the layer could be penetrated. Recently it had been found that curious echoes of wireless signals were being obtained many seconds after they were sent out. For example, Prof. Störmer had heard signals from station PCJJ working on 30 metres. That revolutionary result had been confirmed by various investigators. Prof. Störmer suggested that the echoes were produced by waves which had penetrated the Heaviside layer and had gone out into space and been reflected back by electricity shot out from the sun. That hypothesis was most attractive, and appeared to fit in with the times at which the echoes were observed. Short waves, although not suitable for short-distance work, were most suitable for long-distance transmission. They were at times almost embarrassing, for not only did signals arrive in both directions round the earth, but they also travelled three and four times round the earth with very little loss of strength.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia. — Melbourne. — January 8th. Department of Posts and Telegraphs. Switching equipment and relays. (B.X. 4880);* fuses, heat coils, and arrestors. (B.X. 4881.)*
January 15th. Telephone transformers. (B.X. 4878.)* Coil posts. (B.X. 4879.)*
January 22nd. Telephonists' telephones. (B.X. 4888.)* Telephone transmitters and parts. (B.X. 4889.)* Telephone receivers and parts. (B.X. 4890.)*
January 29th. Accumulator batteries and counter e.m.f. cells. (B.X. 4906.)*
January 16th. Victorian Railway Commissioners. Rotary convertor or rectifier set for Glen Waverley sub-station. (B.X. 4893.)*
February 4th. State Electricity Commission of Victoria. 11,000-V switchgear for Yallourn power station. (B.X. 4897.)* 11,000-V and 22,000-V switchgear and accessories for Richmond. (B.X. 4898 and 4901.)*
January 14th. 11,000-V transformers and spares. (B.X. 4900.)*
February 4th. Pillar insulators with metal parts, for use on 132,000-V outdoor circuits. (B.X. 4921.)*

Belfast.—January 7th. Electricity Department. H.p. armoured switchgear. (See this issue.)

Brentwood.—January 21st. Essex and Colchester Mental Hospital Committee. Wiring Brentwood Mental Hospital. (See this issue.)

Clydebank.—December 21st. Town Council. Electric lighting installation for the Maternity and Child Welfare Centre. Specifications from Town Clerk.

Edinburgh.—December 18th. District Board of Control. Lancashire boilers, economisers and engineering plant required for Gogarburn. Specifications from the architect, Mr. Stewart Kaye, 14, Hill Street, Edinburgh.

Egypt.—Cairo.—January 24th. Ministry of the Interior. Installation of an electrical system at Beba. (B.X. 4916.)*
January 31st. Diesel engine-driven d.c. generator set, d.c. rotary balancer and accessories for the Kafr El Zayat electric station. (B.X. 4931.)*

London.—Central Electricity Board.—January 4th, 1929. 132,000-V transformers in connection with the South-East England Electricity Scheme, 1927. (November 2nd.)
December 17th. Central Scotland Electricity Scheme. Oil filtering and storage equipment for 13 outdoor transforming stations. (November 30th.)
Islington.—January 2nd. Electricity Department. E.h.p. switchgear and accessories. (November 23rd.)
January 18th. One 5,000-kVA and one 375-kVA or one 750-kVA Scott-connected transformers. (November 23rd.)
Materials for 12 months, including cables, meters, transformers, &c. (See this issue.)

Middlesbrough.—December 31st. Education Committee. Installation of electric lighting of 10 Council schools and the Stockton Street Practical Instruction Centre. (See this issue.)

New Zealand. — Wellington. — February 19th. Public Works Department. 110-kV switchgear and controlling equipment for Waitaki electric power scheme. (B.X. 4848.)*
March 5th. Seven 5,500-kVA single-phase transformers. (B.X. 4873.)*
January 15th. Posts and Telegraph Department. Telephone cords. (B.X. 4847.)* Vitreous enamel phase-indicating plates. (B.X. 4927.)*

Salford.—January 4th. Electricity Department. E.h.p. and l.p. lead-covered cables. (See this issue.)

South Africa. — JOHANNESBURG. — January 10th. South African Railways and Harbours. Five electrically-driven traversers and one 5-ton hand-operated overhead travelling crane. (A. 7170.)*

GRAHAMSTOWN.—January 22nd. Municipal Council. Cables, transmission lines and transformers. (B.X. 4913.)* Centrifugal pumps, motors and cable. (A.X. 7187.)*

PRETORIA.—January 24th. Posts and Telegraphs Department. Telephone switchboards. (B.X. 4912.)*

Southend.—December 31st. Light Railways and Electricity Department. 3,000 joint boxes. (November 30th.)

Stafford.—December 28th. Education Committee. Installation of electric light and power in the County Mining College, Cannock. (December 7th.)

Stoke-on-Trent.—January 16th. Electricity Department. L.p. d.c. switchboard; e.h.p. ironclad switchgear. (December 7th.)

Turkey.—ANGORA.—December 18th. Post, Telegraphs and Telephones Department. 50,000 metres of rubber-covered field-telephone wire. (B.X. 4849.)*

CONSTANTINOPLE.—January 5th. Posts, Telephones and Telegraphs Department. 60,000 porcelain insulators and 15,000 swan neck fittings. (B.X. 4904.)*

Wakefield.—December 19th. West Riding Education Committee. Installation of electric lighting at Wath Secondary School. Specifications from Education Department, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Belgium.—Belgian, Dutch, Swiss and British (C. A. Parsons & Co., Ltd.) firms submitted tenders last week to the municipal authorities of Ixelles, Brussels, for the supply of a new steam turbine for the local electric power station. The tenders ranged from £4,000 to £9,664, the lowest being that of the Société des Ateliers de Constructions de la Meuse, of Sclessin, Belgium.

Brighton.—Electricity Committee. Recommended:—
Two 200-kVA transformers (£277).—Ferranti, Ltd.
L.p. switchboard (£585).—George Ellison.
Street lighting switches.—L. Weekes (Luton), Ltd.
Earth cones.—Croydon Engineering Co., Ltd.
One 300-A, 11,000-V switch panel (£329).—A. Reyrolle and Co., Ltd.
Switchgear (£823) and l.t. switch panel (£505).—Metropolitan-Vickers Electrical Co., Ltd.

Dublin.—Electricity Department. Accepted:—
Meters for 12 months.—Société Genevoise d'Instruments de Physique, Drake & Gorham Wholesale, Ltd., and Metropolitan-Vickers Electrical Co., Ltd.

East Ham.—Sewage and Baths Committee. Recommended:—
Spare armature for charging plant (£108).—Crompton Parkinson, Ltd.
Pump and motor (£333).—Pulsometer Engineering Co.

Halifax.—Town Council. Accepted:—
Seven new tramcars (£15,400).—English Electric Co., Ltd.

Hull.—Telephones Committee. Recommended:—
Cable (£351).—Siemens & Halske A.G.

London.—SOUTHWARK.—Electricity Committee.
Cable:—

W. T. Glover & Co., Ltd.	£3,342
Callender's Cable & Construction Co., Ltd.	3,129
Pirelli-General Cable Works, Ltd.	3,099
Enfield Cable Works, Ltd.	3,053
Metropolitan Electric Cable & Construction Co., Ltd.	3,237
Union Cable Co., Ltd.	3,064
W. T. Henley's Telegraph Works Co., Ltd.	3,076
Liverpool Electric Cables, Ltd.	3,092
British Insulated Cables, Ltd.	3,103
Standard Telephones & Cables, Ltd.	3,097
Macintosh Cable Co., Ltd.	3,054
Johnson & Phillips, Ltd.	3,094
Siemens Bros. & Co., Ltd.	3,066
HACKBRIDGE CABLE CO., LTD. (Recommended.)	3,018
Standard Insulator Co., Ltd.	4,020
Electrical Equipment Co., Ltd.	3,089
Netherland Cable Works	2,888
Société Industrielle des Téléphones	3,201
Power & Lighting Cables, Ltd.	2,854
Ernest Garrard	2,955

Feeder pillars:—

LUCY & Co. (Recommended.)	£54

METROPOLITAN ASYLUMS BOARD.—Works Committee. Installation of electric light at St. Anne's Home:—

SEMARKS & Co., LTD. (Recommended.)	£380
British Electrical Installations Co.	380
G. E. Wallis & Sons, Ltd.	389
W. Smith & Co.	397
Alpha Manufacturing & Electrical Co., Ltd.	398
S. & A. Freed	409
T. Clarke & Co., Ltd.	426
E. C. Spray	427
J. Briggs, Electrical Contractors, Ltd.	435
Wallace & Sons	473
Read & Partners, Ltd.	497

Chesterfield.—Town Council. Accepted:—
Cable for miscellaneous extensions (£1,810).—Greenwich Cable Works, Ltd.
150-kW mercury arc rectifier equipment and transformer for the extension of the railless electric vehicle system to New Whittington (£960).—Hewittic Electric Co., Ltd.
E.h.p. switchgear (£204).—British Thomson-Houston Co., Ltd.

Maidstone.—Town Council. Accepted:—
Testing set for a.c. meters (£110).—Ferranti, Ltd.

Sowerby Bridge.—Urban Council. Accepted:—
Electrical work at 16 houses.—Harrison & Co., Halifax.

Warrington.—Electricity Committee. Accepted:—
Extraction water pump.—Brush Electrical Engineering Co., Ltd.

Wimbledon.—Electricity Committee. Recommended:—
Alterations to 11,000-V switchgear, &c. (£230).—A. Reyrolle & Co., Ltd.

Forthcoming Events.

Birmingham Electric Club.—Friday, December 14th. Grand Hotel, Birmingham. 7 p.m. Annual meeting.

Polytechnic Engineering Society.—Friday, December 14th. Polytechnic, Regent Street, W. 7.30 p.m. Annual conversazione.

Physical Society.—Friday, December 14th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Association of Mining Electrical Engineers (Western Sub-Branch).—Saturday, December 15th. 60, Wind Street, Swansea. "Some Electrical Tests." Mr. E. W. Davies.

(Lothians Branch).—Saturday, December 15th. Philosophical Rooms, Queen Street, Edinburgh. Paper by Mr. J. Finlay.

Nottingham Society of Engineers.—Monday, December 17th. Victoria Station Hotel. 7.30 p.m. Joint meeting with the Derby Society of Engineers. "Engineering Fallacies." Mr. A. S. E. Ackermann.

Overhead Lines Association.—Wednesday, December 19th. Institution of Electrical Engineers, Savoy Place, W.C. 5.30 p.m. "Insulators." Mr. C. W. Marshall.

Institution of Electrical Engineers.—SWAN CELEBRATION.—Thursday, December 20th. Institution, London, W.C. 5.30 p.m. Lecture on "Swan's Work," by Mr. J. Swinburne, F.R.S. (Light refreshments at 5.0 p.m.)
6 p.m. "An Introduction to Researches on Circuit Breaking" (Electrical Research Association Report). Messrs. E. B. Wedmore, W. B. Whitney, and C. E. R. Bruce.

(North-Western Centre).—Friday, December 14th. Manchester College of Technology. 7.30 p.m. Faraday Lecture. "How Electricity does Things." Mr. Ll. B. Atkinson.

(Tees-side Sub-Centre). — Wednesday, December 19th. Cleveland Technical Institute, Middlesbrough. 7 p.m. Ordinary meeting.

(London Students' Section).—Friday, December 14th. Institution, London, W.C. 6.15 p.m. "The Applications of Electricity in the Printing Industry." Mr. T. H. Lockett.

(North-Western Students' Section). — Tuesday, December 18th. Engineers' Club, Manchester. 7.15 p.m. "Power Station Sites." Mr. E. Tatton.

British Electrical Development Association. — Friday, December 21st. Royal Society of Arts. John Street, Adelphi, W.C. 7.30 p.m. "Hire and Hire-Purchase in Electrical Development Schemes." Mr. J. E. Tapper.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

Three Star Canadian beauty washer.
Collins flash lamp generating set.

Notes.

E.P.E.A. Dinner.

The sixth annual dinner of the West Yorkshire Section of the Electrical Power Engineers' Association took place on December 8th, at Leeds. Mr. W. Toynbee, chairman of the Section, presided. The Lord Mayor of Hull (Councillor B. P. Pearlman), proposing "The Association," expressed himself a strong believer in professional and craft associations which aimed at improving the conditions under which service to the community was given. He had no sympathy with any enterprise, public or private, which did not pay the price of a man's service and capacity.

Mr. A. C. Steward, president, E.P.E.A., in response, said that one of the happiest factors in moving about the country was to find the happy relationships which existed between the Association and the controlling authorities of electrical undertakings. The organisation was out with a purely economic policy to obtain a decent wage for station engineers. That being achieved, the next ideal was to see to it that for that wage they "delivered the goods." There was no question that the Association had achieved both those objects to a very considerable extent.

The Lord Mayor of Leeds (Alderman D. B. Foster), proposing the toast of "The National and District Joint Boards," said he hoped that the new Leeds super-station would be generating at least 50,000 kW by next October, although he did not pretend that the place would be completed by then. Leeds was very proud of its new great station, and particularly proud of its engineer, Mr. C. N. Hefford, to whom so much of the conception was due. There were at least 10,000 people in Leeds to-day using electricity who were not using it before the assisted-wiring scheme was introduced.

Mr. G. E. Smith, senior vice-president of the Association, suggested that the importance of the industrial boards would probably never be more fully realised than when they came to deal with the great problem of the displacement of generating staffs which was bound to occur. It was cheering to hear that some leaders in the industry felt that practically every man would be absorbed; the men did not want compensation so much as they wanted their jobs.

Mr. A. C. Ivimy (Leeds Corporation Electricity Department) proposed a toast to the ladies and other guests, and Mr. J. N. Waite, M.I.E.E., deputy electrical engineer, Bradford, and newly-appointed city electrical engineer of Hull, responded.

Manchester Electrical Engineers' Dance.

The annual Electrical Engineers' Dance, which takes place in Manchester, was held at the Midland Hotel on Friday evening last, the number of guests present being approximately 250. As is usual, the function proved an exceedingly enjoyable one. The "Gleneagles" band provided excellent dance music, and a very successful cabaret entertainment was given by the "Delfont Boys" and "Yvonne and Ernest." Among those present we noticed Dr. and Mrs. S. Z. de Ferranti, Mr. and Mrs. Vincent Ferranti, Mr. and Mrs. Fedden, Mr. and Mrs. Taite (Mr. Taite being a very effective Master of Ceremonies), Mr. and Mrs. Lunn, and a number of well-known representatives of the manufacturing side. Mr. Harcourt Williams and his Executive Committee may once again congratulate themselves on having provided a most delightful evening's entertainment.

Association of Consulting Engineers (Inc.).

On December 5th the annual dinner of the Association of Consulting Engineers (Incorporated) was held at St. Stephen's Club, London, the chairman of the committee, Mr. H. H. Humphreys, M.Inst.C.E., M.I.Mech.E., presiding over a company of some 160 members and guests.

The toast of "The King" was proposed by the Chairman with sympathetic references to his Majesty's serious illness, and was honoured with equal feeling. Mr. H. W. Couzens, M.I.E.E., proposed "Local Government," which, he declared, in this country was second to none in the world. The Mayor of Westminster (Major V. B. Rogers, D.S.O., M.C.) responded, reviewing the history of the City. "Bench and Bar" was proposed by Mr. F. W. La Trobe-Bateman, M.Inst.C.E., Mr. Justice Hawke and Mr. W. J. Jeeves, C.B.E., responding; the latter remarked that the whole object of the Association was to maintain high standards, and that the interests of a client were pre-eminent. Mr. A. W. Lewis, M.Inst.C.E., proposed "Industrial Progress," and Mr. Frank Hodges, responding, expressed the confidence of the Central Electricity Board in its engineers. He suggested that the conquest of Nature seemed to have left mankind in a less happy state than he was in before it; social problems were intensified—not the fault of the engineers. He held that industrial progress was of little value compared with the knowledge that would lead to human benefaction.

Lt.-Col. K. Edgcumbe, R.E. (T.), president I.E.E., proposed the toast of "The Association of Consulting Engineers," remarking that he was pleased to do so as a manufacturer; good feeling now existed between consulting engineers and manufacturers—but it had not always been so. It was difficult to estimate the extraordinary value of the consulting engineer to this country; nowhere else could the profession find a parallel. Mr. Humphreys responded, and pointed out that the members of the Association promoted good feeling between employer and contractor, by securing a square deal for both parties.

The Sydney Bribery Charges.

The Sydney correspondent of the *Daily Telegraph* reports the dismissal of the appeal of Mr. S. Y. Maling against the sentence of six months' imprisonment and a fine of £500 for accepting a bribe of £10,000 in connection with a contract for the Sydney Electricity Department, of which he was deputy general manager. In dismissing the appeal, the judge said that if he had had the power he would have increased the sentence to two years; Maling's crime was "a contemptible form of stealing."

On December 11th a Sydney magistrate heard a charge against Messrs. Babcock & Wilcox, Ltd., arising out of the proceedings against Maling. A representative of the company said that they had been the victims of blackmail. The magistrate imposed a fine of £1,000 and ordered the company to pay the City Council £10,600 within six months, this being the amount involved in the charge. A stay of proceedings was granted with a view to an appeal by the defendants.

It is also reported that the charge of receiving a bribe preferred against Alderman Green, formerly a member of the City Council, has been dismissed.

Train Accident Report.

The report on the official inquiry into the cause of the accident which occurred in August in the kitchen of a L. & N.E. Railway dining car at Leeds Central railway station, when a kitchen porter died from electric shock, has just been issued. Prolonged investigation and discussion failed to determine definitely the cause of the accident, but it is practically certain that in some way shock was obtained from an electric fish kettle; in some places one of the supply leads to the kettle, in close proximity to the apparatus, was bare. Various recommendations are made to avoid a recurrence of the accident by keeping the electrical apparatus in perfect order. In the concluding remarks of the report appears the following: "It is to be hoped that this unfortunate fatality, which was evidently due to very unusual circumstances, will not retard in any way the extension of electric cooking in dining cars. The ever-increasing use of electricity for domestic cooking, under conditions which are far less favourable to expert supervision and maintenance of equipment, indicates that the liability of danger therefrom may be considered almost negligible."

E.A.W. Activities.

At a meeting of the Rugby branch of the Electrical Association for Women, held on November 29th, a talk and demonstration on "Fuses" was given by Mr. A. S. Kettle, of the British Thomson-Houston Co., Ltd. "Electricity in the Service of Man" was the title of the Faraday lecture given by Dr. S. Z. de Ferranti at a joint meeting of the Birmingham and Midlands branch of the Electrical Association for Women and the Institute of Electrical Engineers held at Birmingham on December 5th. In a lecture before the Birmingham branch recently, Miss Partridge dealt with the field of employment for women in connection with rural electrification. On October 31st members of the Birmingham branch of the Association were addressed by Mr. Francis, of the Electrical Development Association, on "Electricity and Public Health."

On December 4th members of the Birmingham and Midlands branch of the Electrical Association for Women visited the Britannia Works, at Tividale, of Revo Electric Co., Ltd., where they inspected the company's latest development in restaurant cooking apparatus.

The Dowager Lady Swaythling, who is a recent member of the Electrical Association for Women, took the chair for Mr. S. C. Hurry, of the Jackson Electric Stove Co., Ltd., on December 5th, when he gave a talk on "Electric Water Heating in Old and New Houses" before the Association.

Appointments Vacant.

Assistant power station superintendent (£500) for the Government of Ceylon Electrical Department. Improver for switchboard and mains, for the Beckenham U.D.C. Electricity Department. Store clerk (50s.) for the Basingstoke Corporation Electricity Department. (See our advertisement pages to-day.)

Northampton Polytechnic Conversazione.

The annual prize distribution and conversazione were held at the Polytechnic, Clerkenwell, on Friday, December 7th. The prizes were presented by Sir Dugald Clerk, and the presentation was preceded and followed by organ recitals by the

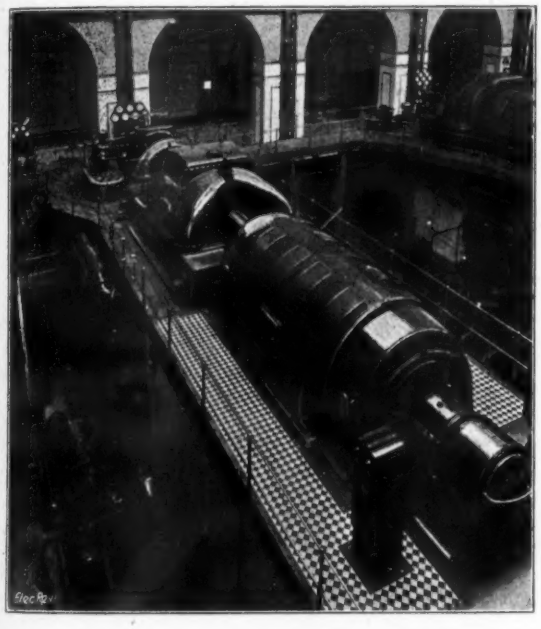
Polytechnic organist, Mr. S. Dicker. Mr. S. C. Laws, M.A., M.Sc., Principal, in presenting the report on the progress made during the past year, stated that the number of students had increased to nearly 3,000. The laboratories, workshops, &c., were opened to the visitors for inspection, and the students demonstrated their machines and work. A gymnastic display was also given. On Saturday the programme was continued, with an excellent promenade concert given by the Polytechnic Choral and Operatic Society and the Polytechnic Orchestra. There were also boxing, badminton, swimming and gymnastic displays, and the conversazione was concluded with dancing. The function was well attended and was a great success.

The Radiological Exhibition.

In the review of the "Solus" Electrical Co.'s exhibits at the above-named show it was stated (p. 972, December 7th issue) that the six-valve set transformer's current rating was 100 mA, which is incorrect, for it was designed for 300 milli-amperes. The error is regretted.

Extension in Belfast.

On November 22nd Lady Turner, J.P., officially inaugurated a new turbo-alternator set at the Belfast Corporation electricity works. The set was supplied by the Metropolitan-Vickers Electrical Co., Ltd. It is rated at 18,750 kW



18,750-kW Turbo-alternator at Belfast.

maximum, 0.8 p.f., and 15,000 kW economical; 3,000 r.p.m., 3-phase, 50 cycles, 6,600 V. The turbine is a 2-cylinder impulse-type machine, incorporating two-stage feed heating. The stop valve conditions are 200 lb./sq in. and 600 deg. F. It is interesting to note that the new set is of 50 per cent. greater capacity than the last two sets installed, and runs at double the speed. An improvement of approximately 7½ per cent. in heat consumption has been effected by the latest installation.

Ex-National Telephone Staff Dinner.

The response to the intimation made in October of a proposed gathering in London of the staff of the late National Telephone Co. was so hearty and widespread that both the Victoria Hall and the ball room at the new Criterion Restaurant, Piccadilly Circus, were needed to accommodate the 430 ladies and gentlemen who dined together on November 10th under the chairmanship of Lieut.-Col. C. B. Clay, V.D., M.I.E.E., who, following the loyal toasts, proposed the health of "Old Associates," adding the words "and new." He recognised many veterans amongst them and, having got together, could they not stick together and dine together periodically? He suggested the formation of a British telephone pioneers' society.

Lord HARRIS, G.C.S.I., G.C.I.E., the last surviving director of the N.T. Co., in responding, congratulated the chairman on having collected so memorable a gathering. Mr. Stanley J. Goddard, Mr. W. A. Valentine, C.B.E., and Col. T. F. Purves, O.B.E., engineer-in-chief of the G.P.O., also replied.

Mr. F. GILL, O.B.E., in proposing the chairman's health, which toast was accorded musical honours, asked if it was realised that, with the telephone in that room, it was possible to select any one of 26 million other telephones. Nevertheless, this country was undeveloped telephonically, and there was much unemployment. Instead of spending much money on road construction, would it not be more worth while to build "telephone roads"? There was an opportunity to do something, and quickly, which would take men off the "dole" and lead them into a skilled trade, instead of merely assisting them temporarily.

Lieut.-Col. CLAY responded briefly.

Messrs. T. A. Prout and H. M. Darville, secretary and treasurer of the Arrangements Committee, are to be complimented on the success of the evening's re-union, and the entertainers, too, for their programme of music. Friends who had been associated with the telephone industry prior to the transfer of the service to the State in 1912, as well as P.O. officers, were welcomed, and the gathering consequently included many of the pioneers. Besides those already mentioned, Messrs. C. J. Phillips and J. S. Holt (who is 85 years of age), two of the oldest telephone men, and Messrs. W. W. Cook, A. Anns, Sinclair, Col. J. C. Chambers, C.B., A. Coleman, Dalzell, G. F. Preston, C.B.E., and R. Shepherd were a few of those present.

South Wales Mining Electrical Engineers.

At a joint meeting of the South Wales and Monmouthshire branch of the Association of Colliery Managers and the South Wales branch of the Association of Mining Electrical Engineers held recently, the adjourned discussion on Mr. S. B. Haslam's paper, "Modern Methods of Firing Steam Boilers," was continued. Major E. Ivor Davies referred to an experimental plant in South Wales which was operating on the direct gasification system, burning anthracite shale, and said it could be regarded as reasonably successful. In a lecture at the same meeting on "The Bulk Handling of Coal, Ore and Grain," Mr. H. H. Broughton said that of the 2,849 mines in Great Britain, no fewer than 1,253, or 45 per cent., could either not afford to use, or were compelled to do without, a supply of electrical energy. The amount of fuel consumed at the mines in the uneconomic generation of power exceeded by many times the fuel consumed by the whole of the public electricity supply undertakings in Great Britain.

Electricity versus Gas.

At a meeting of the Torquay Debating Society recently, Mr. H. F. G. Woods, borough electrical engineer, championing the cause of electricity, said it was not true to suggest that electricity generating stations were wasting coal; they burnt dross and rubbish which was not suitable for gas production, and which could not be used in any other way. At the Torquay station at Newton Abbot they used waste from the Great Western Railway locomotives, which cost 5s. per ton. The gas interests, which were among the most powerful vested interests in the country, were fighting a losing battle. They had had 100 years' start of electricity, but they had lost the lighting business and they were going to lose the cooking and heating. Electricity would do anything and everything gas would do, better and more economically, but the industry had been handicapped in the past by restrictive legislation, and had suffered from an ineffective sales organisation. Gas was a fuel, but electricity was not a fuel—it was energy. At Torquay they could not get electric cookers fast enough; they had 1,200 out and were sending out six per week.

Train Collision Report.

The report of the official inquiry into the causes of the collision between an electric passenger train and buffer stops, which occurred on September 19th at Charing Cross Station, shows that the motorman failed to use the Westinghouse air brake properly.

E.T.B.I. Ball.

The annual ball of the North-East Coast section of the Electrical Trades Benevolent Institution was held at Newcastle on November 30th. It was a very successful show, and reflected great credit on the organising ability of Mr. H. E. Turner, hon. secretary, and the other members of the Dance Committee. It is hoped that the result of the function will be a considerable contribution to the Institution's funds.

Institution Notes.

Institution of Electrical Engineers.

PORTRAIT PRESENTATIONS.—At its ordinary meeting on December 6th, Sir George Sutton, Bt., presented to the Institution an oil painting of Wheatstone, by Sir William Llewellyn, K.C.V.O., R.A., and Mr. R. W. Paul presented an oil portrait of Volta, painted by Signor G. Palanti, of Milan, both of which have been hung in the lecture theatre. Lieut.-Col. K. Edgcumbe, T.D., R.E.T. (Ret.), president, accepted the gifts on behalf of the I.E.E. Council.

Junior Institution of Engineers.

At an informal meeting held on November 30th, Mr. C. W. Harvey gave some interesting particulars of the process of manufacture of decorative metal work such as electric light fittings, door furniture, decorative lanterns, and works of art in metal generally. The author stated that the modern tendency in the design of large electroliers and similar constructions was to have as little metal visible as possible, shaped and coloured glass forming the main portion of the structures.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. Robert Blackmore, A.M.I.E.E., has been appointed district engineer for the North-West England and North Wales Electricity Scheme, 1928, under the Central Electricity Board. Mr. Blackmore will take up his new duties on January 1st, 1929. He is at present engineer-in-chief of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board, a position which he has held since 1904. Prior to joining the Board he was with the St. James' and Pall Mall Electric Lighting Co., Ltd., and the National Electric Supply Co., Preston, later becoming city electrical engineer of Wakefield. Mr. Blackmore has acted during recent years as consulting engineer to the Accrington, Fleetwood, Glossop, Leigh, Nelson, Oldham, and other local authorities, and his wide experience of textile mills has led to his selection as consultant in the electrification of about a hundred factories.

A recommendation that the salary of Mr. Charles Furness, electrical engineer and tramways manager at Blackpool, be increased from £1,250 to £1,600, was discussed by the Town Council on December 5th. The capital outlay on the two departments controlled by Mr. Furness is £1,500,000, and they have a combined revenue of over half-a-million a year. The open council decided to refer the question to the Staff Salaries' Sub-Committee for further consideration. Councillor Taylor advocated that the recommendation be thrown out altogether. Whereas the Committee proposed to increase Mr. Furness's salary by £350 a year, they had decided to divide only £201 among certain members of his staff for special services during the autumn illuminations. Alderman Hill said that some time ago a proposal was put forward to increase the salaries of four head officials from £1,250 to £1,500. The Ratepayers' Association protested and the proposal was withdrawn. Similar opposition would be forthcoming if the salaries of the four officials were reviewed just now. He asked that Mr. Furness's salary be considered on its own merits.

At the meeting of the Barrow Town Council on December 3rd, the resignation of the tramway manager, Mr. J. R. Groves, through ill-health, was accepted, and the payment to him of a retiring allowance of £260 per annum was approved. Alderman Bell, chairman of the Tramways Committee, expressed the Committee's regret that Mr. Groves had found it necessary to retire. He had continued as manager when the Corporation took over the undertaking from the British Electric Traction Co., and had had practically 40 years' experience of tramway and omnibus management. The alderman considered that the town was losing a very valuable, conscientious servant, and he hoped that Mr. Groves would regain some of his former strength in his retirement.

The Tunbridge Wells Town Council has granted the following increases of salary: Mr. J. E. Pownall, chief assistant electrical engineer, from £600 to £650 per annum; Mr. W. Matthews, mains superintendent, from £418 to £452; Mr. E. Woolgar, station superintendent, from £324 to £351; Messrs. R. A. C. Baldwin, D. Lewis, and J. Lonie, charge engineers, from £303 to £319; and Mr. A. H. Abrahams, junior charge engineer, from £215 to £231.

The colleagues of Mr. W. F. Vinehill, of the staff of the Tunbridge Wells Corporation Electricity Works, who has obtained an appointment at the Coventry City power station, have presented him with a suit-case. The presentation was made on November 30th by the chief engineer, Mr. R. N. Torpy.

Mr. Richard Hoggard, transport manager of Lincoln Corporation tramways and 'buses, was last week appointed transport manager at Chesterfield in succession to Mr. W. G. Markes, who has secured a similar appointment at Nottingham. Mr. Hoggard, who is 43 years of age, was on the tramway staff of the Sheffield Corporation for 20 years, and was appointed to his present post at Lincoln in 1921.

Mr. Arthur Teasdale, who was presented on December 6th with a gold watch in recognition of 45 years' service with Westhoughton Cannel Co., was Westhoughton's first electrician. He took charge of the first local electrical plant installed at the colliery.

Mr. W. T. Tallent-Bateman, who for the last five years has managed the affairs of Messrs. Ferguson, Pailin, Ltd., in India, Burma, Ceylon, and South Africa, is about to return to England for a few months' stay; he arrives at Southampton in the R.M.S. *Windsor Castle* due on December 17th. Mr. Bateman's temporary address will be c/o Mr. H. T. Hughes, Mayfield House, Chapel-en-le-Frith, *via* Stockport.

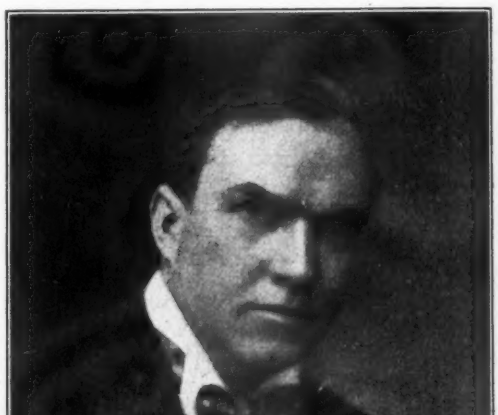
Mr. Robert M. Dowson, A.M.I.Mech.E., has been appointed managing director of the British Metallic Packings Co., Ltd.

The *Financial Times* states that Mr. W. G. Verdon Smith, of the Bristol Tramways & Carriage Co., has been elected president of the Chartered Institute of Secretaries.

It is announced that the President of the Board of Trade has appointed Mr. E. R. Eddison to be Director of the Empire Trades and Economic Division in the Department of Overseas Trade in place of the late Mr. R. W. Matthews. Mr. J. J. Wills will be Comptroller of the Companies Department, Board of Trade, in place of Mr. Eddison.

Capt. H. Hooper, the hon. secretary of the South Midland Centre of the I.E.E., was recently appointed assistant to Mr. S. T. Allen, Central England Engineer to the Central Electricity Board. For the last nine years Capt. Hooper was Central England sales manager for Messrs. Veritys, Ltd. Prior to the war he was with the Birmingham Electric Supply Department, and during the war he held a commission in the Royal Engineers and the Royal Air Force

We reproduce herewith a portrait of Mr. R. Stuart Pilcher, whose appointment as general manager of the Manchester Corporation Tramways was confirmed by the City Council last week. Mr. Pilcher was born in Liverpool, and received his training as an electrical engineer with the Montreal Street Railway Co., Canada, and he has studied tramway conditions in the United States and most Continental countries. From 1901 to 1904 he was assistant electrical engineer to the Birkenhead Corporation tramways, and he subsequently became traffic manager of the Burton Corporation tramways and general manager and engineer of the Aberdeen Corporation system. In 1918 he was appointed transport manager and engineer of the Edinburgh Corporation Transport Department, a position which he now vacates. During Mr. Pilcher's time



Mr. R. S. Pilcher.

The new General Manager of the Manchester Tramways.

at Edinburgh he has been responsible for the conversion of the old cable system to electric traction, work which he accomplished in eleven months. The Prince's Street section was converted in one night. The change-over and subsequent extensions were carried out by direct labour under Mr. Pilcher's personal supervision. In addition to his tramway work, during the course of which he has acted as adviser to other municipal authorities, Mr. Pilcher has interested himself in public work of various kinds. He is a past-president of the Royal Society of Arts, Edinburgh, a Fellow of the Royal Society, Edinburgh, chairman of the Edinburgh branch of the League of Nations Union, and president of the Edinburgh Rotary Club. He is also a member of the executive of the Municipal Tramways and Transport Association and secretary of the Scottish Section of the Institute of Transport.

Obituary.—Mr. A. E. Marland.—The death occurred on November 24th of Mr. A. E. Marland, who had all his life been with Messrs. J. P. Hall & Co., Ltd., of the Blackriding Works, Werneth, Oldham. He entered the service of the firm as a boy 40 years ago, and at the time of his death he held the position of secretary. He served for some years on the Town Council.

MR. A. C. FARRINGTON.—The death has taken place at Sittingbourne of Mr. Alfred Charles Farrington, who for the past ten years had been electrical engineer at the Queenborough Pottery Works. He was 54 years of age.

ALDERMAN A. WILKINSON.—We regret to state that the Mayor of Luton, Alderman Albert Wilkinson, J.P., died on Friday last after a very serious operation. It is within the personal recollection of ourselves and other electrical editors, as well as many other representatives of various branches of the electrical industry that the late alderman was a very enthusiastic supporter of electricity supply. He was chairman of the Luton Electricity Committee for over 20 years, chairman of the Home Counties (No. 9 Area) Joint Industrial Council for the Electricity Supply Industry, chairman of the Home Counties (No. 9 Area) District Joint Board of Employers, and Members of Staff for the Electricity Supply Industry, a member of the National Joint Industrial Council for the Electricity Supply Industry, and a member of the National Joint Board for the Electricity Supply Industry. He took a justifiable pride in the enterprising policy that characterised the Luton undertaking, as evidenced by the fact that, as the result of economical management a supply of electricity is available for everybody, domestic and industrial, at a remarkably low rate. He will be greatly missed. The funeral took place on Wednesday afternoon.

MR. W. J. H. DIPLOCK.—We regret to learn of the death of Mr. W. J. H. Diplock, joint managing director of Erith's Engineering Co., Ltd., which occurred on December 5th at his home at Croydon very suddenly and unexpectedly from heart failure, in his 53rd year. For a number of years before joining the firm of Erith's Engineering Co., Ltd., Mr. Diplock was a solicitor in practice for himself. He possessed a somewhat unique knowledge of patent and contract law, apart from a considerable acquaintance with engineering and other matters.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Radiovisor Foreign and Colonial, Ltd.—Registered December 5th. Capital, £450,000 in £1 shares. Objects: To adopt agreements (*a*) with Hugh Terrell, and (*b*) the Associated Anglo-Atlantic Corporation, Ltd.; to manufacture and deal in selenium and other light sensitive cells, bridges and their applications. The first directors are:—The Duke of Atholl, K.T., 98, Elm Park Gardens, S.W.10; Hugh Terrell, 64, Victoria Street, S.W.1 (director of Armco International Corporation); Jas. Swinburne, M.Inst.C.E., F.R.S., 82, Victoria Street, S.W.1; Lt.-Col. the Hon. Arthur C. Murray, 10, Ennismore Gardens, S.W.7 (director, L. & N.E.R.); John Neale, 15, Acacia Road, N.W.8 (civil engineer); James W. E. Avern, 60, Madrid Road, S.W.13 (managing director, Radiovisor Parent, Ltd.). The last-named company may, while holding £50,000 shares, appoint not more than two directors (or such greater number as shall be equal or nearest to one-third of the total number). Solicitors: Kenneth Brown & Co., Lennox House, Norfolk Street, W.C.2.

Rotapex Electric Co., Ltd.—Private company. Registered December 7th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, and manufacturers, &c., and to acquire the benefit of the trade mark "Rotapex." The first directors are: J. C. Watson, Cloyne, Hollycroft Avenue, Hampstead, N.W.; W. H. Mason, 30, Glendale Road, Hove. Registered office: 62, Berners Street, W.1.

Pye (Cambridge), Ltd.—Private company. Registered December 7th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio sets and apparatus, and mechanical and electrical appliances, radio and mechanical engineers, &c. The subscribers (each with one share) are: W. J. Lovell and C. P. Staples, 199, Piccadilly, W.1, clerks. Solicitors: Bartlett & Gluckstein, 199, Piccadilly, W.1.

Electrocord, Ltd.—Private company. Registered December 7th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in all apparatus incidental to the synchronising of music to kinematograph pictures, &c. The first directors are: C. C. Murgatroyd, "Glenbrook," 17, Barkby Road, Beeston, Leeds; T. Palmer, 22, Easterley Road, Leeds. Registered office: 1, Cookridge Street, Leeds.

Symphony Gramophone and Radio (Foreign), Ltd.—Registered as a public company December 7th. Capital, £200,000 in 5s. shares. Objects: To adopt an agreement with the Symphony Gramophone & Radio Company, Ltd., and to carry on the business of manufacturers of and dealers in gramophone and phonograph records, gramophones, wireless apparatus, &c. The subscribers (each with one share) are: G. O. Mitchell, solicitor, N. Hart, solicitor, and A. E. Paterson, accountant, all of 21, Panton Street, S.W.1, and four others. Registered office: 1, Cornhill, E.C.

"New Era" Time and Telephone Systems, Ltd.—Private company. Registered December 1st. Capital, £100 in 1s. shares. Objects: To carry on the business of financing and installing synchronised time, signalling and automatic or other telephone systems, &c. The subscribers (each with one share) are: B. C. Booth, Oaklands, Haslington, Crewe, accountant's clerk; S. Jackson, 118, King Street West, Stockport, accountant's clerk. Secretary: H. R. Hayes, 7, Pall Mall, Manchester.

Polperro Electric and Cold Storage Syndicate, Ltd.—Private company. Registered December 3rd. Capital, £200 in £1 shares. Objects: To carry on the business of electric light supply at Polperro and the surrounding districts of Cornwall and elsewhere. The subscribers (each with one share) are: W. S. Taylor, Park House, Thames Ditton, dentist; Mrs. L. Taylor, Park House, Thames Ditton. Solicitors: Spring and Co., 12-13, Henrietta Street, Covent Garden, W.C.

Official Returns of Electrical Companies.

Stearn Electric Co., Ltd.—Capital, £4,000 in £1 shares. Return dated October 12th, 1928. All shares taken up. £2 paid, £3,998 considered as paid. Mortgages and charges: £9,700.

Landis & Gyr, Ltd.—(*a*) Mortgage on freehold land and premises in Victoria Road, Acton, W., known as "Elgee Works," dated November 24th, 1928, to secure £15,000. Holders: Sir Herbert J. Hope, Kt., 14, York House, York Street, Marylebone, W., and others; and (*b*) 2nd mortgage on same property dated November 24th, 1928, to secure £5,000. Holders: Hon. Humphry Legge, Tixall Lodge, Staffs.; and Mrs. F. M. G. Paul, The Mount, Grosvenor Road, St. Albans.

Rangoon Electric Tramway and Supply Co., Ltd.—Capital, £800,000 in 250,000 preference and 550,000 ordinary shares of £1 each. Return dated May 11th, 1928. 250,000 preference and 400,000 ordinary shares taken up. £585,000 paid, £65,000 considered as paid. Mortgages and charges at date of return: £369,939.

Wagner Electric Supplies, Ltd.—Particulars filed of £4,500 debentures authorised November 20th, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Telephones and Accessories, Ltd.—Debenture dated November 23rd, 1928, to secure £150, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Reich, 35-7, Norton Folgate, E.1.

T. C. Gilbert & Co., Ltd.—Capital, £9,000 in £1 shares. Return dated September 11th, 1928. 3,200 shares taken up. £2,300 paid, £900 considered as paid. Mortgages and charges: £806.

Liverpool Electrical Installation Co., Ltd.—Capital, £2,500 in £1 shares. Return dated June 7th, 1928. 1,827 shares taken up. £1,827 paid. Mortgages and charges, nil.

Leatherhead and District Electricity Co., Ltd.—Issue on November 15th, 1928, of £20,000 debentures, part of a series already registered.

Park Wireless, Ltd.—Debenture dated November 20th, 1928, to secure £100 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. Wake, Elmscote, Castle Bromwich, near Birmingham.

C. Barnett, Ltd.—Debenture dated November 15th, 1928, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Miss D. Harper, 26, St. Petersburgh Place, W.2.

Electron Company, Ltd.—Satisfaction to the extent of £100, £700 and £600 respectively on November 12th, 1928, of debentures dated September 22nd, 1925, and February 2nd and 19th, 1926, securing the respective sums of £600, £1,400, and £1,500.

City Notes.

Marconi International Marine Communication Co., Ltd.

An extraordinary general meeting is to be held to-day (Friday) to consider a resolution altering the company's articles of association. In a letter accompanying the notice calling the meeting, the directors state that they have had under consideration the recent activity in the company's shares, and have reason to believe that a substantial proportion of the buying has been on foreign account. While there is no evidence in the possession of the directors that this foreign buying has for its object the placing of the control of the company in foreign hands, they cannot ignore such a possibility. The company is responsible for the radio equipment of over 90 per cent. of the British shipping coming under the compulsory wireless law, and of at least 25 per cent. of the world's shipping. Therefore, the directors regard it as a matter of national importance that any danger of the company's passing under foreign control should be removed. Accordingly they propose to add an article providing that the company shall not enter into any combination or arrangement which would have the effect of transferring the control of the company to foreign interests; that directors shall be natural-born British subjects (this shall not apply to any serving director); that not more than 25 per cent. of the total number of issued shares shall be held under foreign control (for this purpose all outstanding "bearer" shares shall be deemed to be held by foreigners); and that the company shall keep a "Foreign Register" in which the names and addresses of holders of shares under foreign control, and particulars of "bearer" shares shall be entered. A majority of the directors will be able to declare that a share is held by foreign interests, and unless in three weeks proof to the contrary is furnished, power is given to the directors to order the sale of the share to an approved qualified person, or, in default, to sell the share at the market price. Among other matters the directors are also empowered to refuse to register any transfer of shares to what they believe to be foreign control.

Official Notice re Companies.

The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

Auto Electrics, Ltd.
B. Barnett (Electrical Engineers, Leyton), Ltd.
Cambrian Electricity Supply Corporation, Ltd.
Chase Electrical Manufacturing Co., Ltd.
Elco Electric Mfg. Co., Ltd.
Electric Distributing Co., Ltd.
Electrical Coils, Ltd.
Electrical Insulating Composition Co., Ltd.
Electricity, Gas, Share, Debenture, Investment and Guarantee Trust, Ltd.
Halstead Electric Supply Co., Ltd.
Headphones (Manchester), Ltd.
International Radio Manufacturers, Ltd.
Lighting and Power Finance Corporation, Ltd.
Magneto Accumulator and Generator Services, Ltd.
Morgan & Taylors Radio Electric, Ltd.
Northern Wireless Schools, Ltd.
Premier Electrical Supplies, Ltd.
Radio and Electrical Supplies (Bolton), Ltd.
Radio Appliances, Ltd.
Radio Engineering Co., Ltd.
Roddis Electric, Ltd.
Shaftesbury Wireless and Engineering Co., Ltd.
Universal Moulded Insulators, Ltd.
Victor Radio, Ltd.
Whitfield Electrical Co., Ltd.
Willesden Electric, Ltd.
Yera Electrical, Ltd.

Perak River Hydro-Electric Power Co., Ltd.

The report for the year ended July 31st last states that during that period the demand for power in the concession area has increased sufficiently to warrant the addition of a 6,000-kW set to the steam station, raising the capacity to 18,000 kW. Authority has been secured to an increase of £250,000 in the 7 per cent. participating debenture stock; this will be offered to the present debenture holders when it is actually required. At September 30th last contracts had been signed for 12,800 kW of power, representing 58.5 million kWh per annum. There were also under negotiation contracts for a further 14,480 kW—88.7 million kWh per annum. It is hoped to place the steam station in commercial operation very shortly, nearly a year in advance of the programme date. There has been delay in the construction of the hydro-electric works, but the consulting engineers consider that it should be complete by March or April, 1930. Mr. J. F. Ferguson, the general manager in Malaya, has been obliged to return home temporarily on medical advice; satisfactory arrangements have been made to carry on his work. During the year the chairman (Viscount Elibank) and Sir Arnold Gridley, K.B.E., paid visits of inspection to Malaya. A local company was formed to distribute power, purchased in bulk from the company, to small towns in the concession area. This company is named the Kinta Electrical Distribution Co., and has an issued share capital of $350,000, of which the company holds $35,000. Sir Arnold Gridley negotiated a satisfactory contract with the F.M.S. Government for the supply of power in bulk to Ipoh, the principal mining town of the Kinta Valley. Under this contract the Government will purchase 75,000 of the unissued ordinary shares of the company at par. The capital account shows a total expenditure of £1,149,316 to July 31st last.

Western Telegraph Co., Ltd.

The company's annual meeting was held on December 6th. In the course of his speech, the Chairman, Sir John Denison-Pender, K.B.E., said that owing to the merger scheme the books had been closed on March 31st last instead of June 30th; on the former date receipts from the merged cable and radio companies became one. He proceeded to outline the negotiations which had led up to the merger, and pointed out that early this year a similar fusion of interests had taken place between three important American undertakings, while there were persistent rumours of a further American combination to prevent unreasonable competition. Movements on the same lines were in progress in France and Germany. Sir John went on to say:—

"The documents necessary for the formation, under the names of the Merger Company and the Communications Company, are as far advanced as is possible at the moment. They cannot be completed until the terms of, at all events, the more important to the agreements with the Government, those which will affect the constitution of the new companies, have been settled. I understand the drafts of these agreements are well advanced and that we may receive them from the Government at an early date. I am sorry I am not to-day in a position to give you the general terms of the offer, which cannot be made until after the Merger Company has been registered, and then it will have to be made simultaneously to all the shareholders concerned in the Eastern, the Eastern Extension, and Western Telegraph Companies."

Burma Electric Supply Co., Ltd.

Mr. C. O. Webb (chairman) presided at the annual meeting on December 5th, and in presenting the report and accounts (Elec. Rev., November 30th, p. 948) said that owing to the rise in the conversion value of the rupee from 1s. 4d. to 1s. 6d. the profit on exchange had disappeared. The net profit for the year had been reduced by reason of the lower tramway takings and electricity supply revenue. The reduction was due to the bad trade conditions in Mandalay which seemed likely to continue. The lower tramway receipts were, however, mainly due to motor-'bus competition; rules governing these vehicles had now been formulated, and if they were strictly enforced competition would be on a fairer basis. The company had received new tramway and lighting concessions running for 50 years from February 25th, 1928. In view of this the company had agreed to change the pressure of supply from 500 to 250 V and the work was well in hand. The cost would be £45,000. Although the company had been given the right to raise its charges it was expected that the reduced consumption would counteract the increase. As each of the departments of the company had its cloud the directors had thought it wise to reduce the ordinary dividend from 8 to 6 per cent. The chairman, however, expressed the hope that the new regulations and the new system of supply would improve the position.

Prospectuses.

Quebec Power Company.—On Thursday last this company offered for sale £800,000 of 5 per cent. first mortgage and collateral trust sinking fund debenture stock at £97 per cent. The authorised capital consists of 600,000 common shares of no par value, of which 502,372 have been issued; the majority are owned by the Shawinigan Water & Power Co. The company owns five hydro-electric plants, with a capacity of 38,800 h.p., and is the only supplier of electricity and gas in Quebec. In addition, it purchases power from the Shawinigan Company. The combined net earnings for 1927, before providing for interest, were $1,876,000. The proceeds of the issue will be used "to liquidate indebtedness heretofore incurred to retire all funded debts of former subsidiary companies (all of whose assets and properties have been acquired by the company); to retire the 6 per cent. first mortgage bonds and debenture stock of the company called for redemption on April 1st, 1929; and to defray cost of additions and improvements."

Symphony Gramophone and Radio (Foreign), Ltd.—The formation of this company is recorded in the "New Companies" section of this issue. Its purpose is to exploit the foreign rights of the Symphony Gramophone and Radio Co., Ltd. On Monday last the company made an issue of 500,000 5s. shares at par. The parent company receives £35,000 in cash and £40,000 in shares.

Ceara Tramway, Light and Power Co., Ltd.

Speaking at the annual meeting on November 30th, Mr. E. H. R. Trenow (chairman) said that the losses due to the presidential election excitement in Ceara, to general bad trade, and to omnibus competition had been more than offset by economies in operation. The net revenue, however, was lower on account of the fall in the value of the milreis. Steps had been taken to counter the motor-'bus competition; the company was putting a 'bus service of its own into operation, and it was just extending the boiler plant by 40 per cent. The electricity supply undertaking was steadily expanding, and they looked forward to a period of improved business.

Andhra Valley Power Supply Co.

The net profit for the year ended June 30th last, after providing for depreciation, &c., was Rs.6,56,285, to which is added Rs.2,27,097 brought forward, making Rs.8,83,382. From this the preference dividend is paid, and provision is made for bad and doubtful debts and depreciation of investments, and Rs.2,03,142 is carried forward. There was a substantial decline in the gross revenue, due to the general industrial depression and unrest and the taking over of consumers by the Tata Power Co.

Chatham and District Light Railways Co.

A special general meeting is to be held at Crown House, Aldwych, W.C.2, on December 18th, for the purpose of submitting to the shareholders a proposed Parliamentary Bill which would provide for the abandonment of the light railways, tramways, and tramroads owned or worked by the company; authorise the company to run omnibuses; and change the name of the company.

Pinchin, Johnson & Co., Ltd.

At an extraordinary meeting on December 5th a resolution was passed raising the capital to £2,000,000. In moving the resolution, the chairman (Mr. E. Robson) said that it was the definite intention of the board to make an issue on bonus terms which would rank for dividend from January 1st, 1929.

Stock Exchange Notice.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Postal Telegraph and Cable Corporation.—£1,039 5 per cent collateral trust debenture stock and fractional scrip certificates. $162,288 5 per cent. collateral trust gold bonds and fractional scrip certificates.

John Shaw & Sons (Wolverhampton), Ltd.

The directors report a net profit of £11,576 for the year ended June 30th last, against £10,179 for 1926-27. After meeting the preference dividend and again paying 3 per cent. on the ordinary shares, £34,268 is carried forward (against £35,735 brought in).

Radiovisor Foreign and Colonial, Ltd.

This week this company published a statement in compliance with Stock Exchange Regulations. In this it was stated that 380,000 £1 shares (out of a total of £450,000) had been issued and fully paid. The company was formed to exploit various applications of a selenium device, including automatic railway signalling, burglar and fire alarms, &c.

Victoria Falls and Transvaal Power Co., Ltd.

The directors have declared an interim ordinary dividend of 3 per cent. At the same time in addition to the half-yearly dividend, the preference shares are to receive 3 per cent. in respect of participating rights.

Reduction of Capital.

ARON ELECTRICITY METER, LTD., AND REDUCED.—A petition for the confirmation of the reduction of the capital of the company from £350,000 to £225,000 has been presented to the High Court and is now pending.

Petters, Ltd.

The directors have declared the interim dividend on the 7½ per cent. cumulative preference shares in respect of the half-year ended September 30th.

Barcelona Traction, Light and Power Co.

A quarterly dividend of 1¾ per cent. has been declared on the 7 per cent. non-cumulative participating preference shares.

Northern Mexico Power and Development Co.

Dividends of 1¾ per cent. on the preference stock and 1 per cent. on the common stock have been declared.

Globe Telegraph and Trust Co., Ltd.

A quarterly dividend of 5s. (net) per share has been declared on the ordinary shares.

United River Plate Telephone Co., Ltd.

An offer to purchase the undertaking has been received from an American group and the directors recommend its acceptance. The offer puts forward two alternatives: (*a*) For each five ordinary shares £22 10s. in cash and $100 capital stock of the International Telephone and Telegraph Corporation; and (*b*) £12 cash for each ordinary share. It is stipulated that holders of 75 per cent. of the voting power of the company must agree to the transaction by January 3rd. The board states that it has been assured that the equipment for the operation of the company will continue to be manufactured in Great Britain "whenever reasonably practicable."

Power-Gas Corporation, Ltd.

A dividend of 5 per cent. is again being paid; the net profit rose from £15,520 to £18,237.

Stocks and Shares.

MONDAY EVENING.

THE volume of business has fallen off very perceptibly in the Stock Exchange during the past week. This is only natural, of course, in the circumstances of the season, added to which a sharp break occurred in the enthusiasm of the bulls of Americans, coupled with money rates in New York rising to 12 per cent. The latter consideration seemed to bring some of the enthusiasts to earth, and prices gave way very considerably, affecting such shares as Marconi Marines, Mond Nickels and others that have been to some extent affected by the American boom. Amongst the British stocks and shares, improvement occurred in the stock and shares of the Eastern Cable quartette, owing to the very feeble case put up in the House of Commons by the Opposition against the merger. It was concluded from the lukewarm character of the Labour Party's contentions that members cared little whether the scheme went through or not.

Eastern Cables Strong.

Eastern Telegraph stock has risen 6½ to 262. Equivalent rises took place in Eastern Extensions, Globe ordinary and Western Telegraph. Reference to the debate in the House of Commons shows that the Labour Party neglected to lay hold of arguments in which there might reside some degree, at all events, of soundness, and in their place substituted a good deal of what is generally known as "hot air." Anticipation now looks for the distribution of the new stocks and shares against the existing securities of the company to be made early in the New Year, and it is announced that the Bank of England will be in charge of an operation that must be accounted of magnitude for any institution to handle, even the Bank of England itself, accustomed as the Old Lady of Threadneedle Street is to undertake financial operations on the grand scale.

No Cause for Impatience.

Some of the stockholders in the cable companies are inquiring, with a touch of impatience in their tone, how it is that prices do not immediately rise to the level at which it is assumed the new securities will stand when the latter are issued. This point we dealt with recently, observing that at the end of any protracted negotiations that have finished in a manner which realised the anticipations of those who had bought the stocks previously, it is the ordinary thing for profit-taking to set in, and for prices to remain sometimes below the demonstrably appropriate figures which they are likely to attain after the transfer of stocks has taken place, and when the market has become familiarised with the new issues. Eastern Telegraph 3½ per cent. preference stock, it is of interest to note, has lost a point at 67½.

United River Plate Mystery.

United River Plate Telephones have been a good market, advancing to 10 3/16, and thus showing a rise of 16s. 3d. within the past week. Vague rumours are current to account for this advance. It is said that an official announcement is on the point of being made such as will justify the price attaining once more to double figures. Interest is actively employed upon speculation as to what may be the reason for the buying which has raised the price to the present figure. Some kind of statement in respect of the dispute over the rate charges between the company and the Argentine Republic is expected to be made public immediately, but the buyers of the last few days are "going for" more than this. They hint at the possibility of their company being bought out on satisfactory terms, and the mystery adds to the interest aroused by the rapid rise in price. Anglo-Portuguese Telephones at 21s. 10½d. are easier on the week.

Undergrounds.

The Home Railway market has taken a turn for the better, apparently on the assumption that every effort will be made, and every nerve strained to retain in the trustee list the stocks of the London, Midland and Scottish and the London and North-Eastern Railway Companies. The improvement

in prices which this has caused had no influence upon the Tube issues, Metropolitans and Districts being unchanged. Underground Electric Incomes show no improvement after their set-back a week ago, but the £1 shares are 6d. harder at 27s. The new Underground station at Piccadilly Circus was opened to the public to-day, Monday. The Underground group of railways is stated to represent invested capital of £65,766,000. Particulars are published of a new project for a railway between London and Paris, *via* a tunnel under the English Channel, at a cost of 189 million pounds sterling.

Marconi Fluctuations.

Most of the Marconi excitement is centred once more in the shares of the subsidiaries—Marconi Marine and Canadian Marconis. The latter went up, it may be remembered, to £6 a share about a fortnight ago, this price being touched in a wild rush of buying from New York, and cabled to London one evening after the Stock Exchange had closed. From this price it fell, almost like a stone, to 35s., and now is no better than the latter figure. The effervescence has departed from the market, and as speculative counters the shares have ceased to interest the average punter, not even New York appearing to take any particular interest in them. Marconi Marines have been up to 4⅜, but have come back to 3¼, showing a fall of 22s. 6d. on the week. The parent company has declared an interim dividend of 10 per cent. for 1927, making 20 per cent. so far, and this will give the preference 17 per cent. by reason of the participating rights which this issue enjoys. The Marconi directors have decided to postpone the annual general meeting of shareholders until after the offer of the merger company has been made, and the shareholders are in possession of the terms upon which they will be invited to exchange their shares. Although the 10 per cent. dividend is described as being an interim payment, no further dividend for 1927 is contemplated, though in saying this the board adds that it anticipates that it will be possible to declare an interim dividend in respect of the year 1928. The price is ¼ lower, at 75s., than it was a week ago.

American Falls.

American Telephone and Telegraphs have dropped 11 points to 191, and International Telephone and Telegraphs shed 2½ to 197½. Brazilian Tractions at 70 are 6½ points down. The Mexican group of utility companies issues is dull, and there has been a fairly general fall in prices of the shares and of the bonds in these undertakings. Sharp declines occurred also in British Columbia Power A and B, to 55 and 36¼, respectively. In fact, the prices of practically everything connected with the American market, directly or indirectly, have been lowered as a result of the slump which occurred in prices at the end of last week.

New York has been undergoing such a slump as rather suggests a mild panic—although the latter word is perhaps too strong, in view of the fact that such a reaction was inevitable, and that everybody, save those who were gambling on the bull tack, professed to be expecting it, and to entertain no surprise when it arrived. The effect has been felt upon a good many markets round the Stock Exchange, and, taken in conjunction with the more serious bulletins recently issued concerning the health of the King, and also the approach of the end of the year, has brought about a state of dullness more than of depression, and has checked business rather than induced sales.

Electricity Supply.

Amongst electricity supply shares, Metropolitans gained a florin at 45s., otherwise the changes in the list are downwards, there being small declines in Charing Cross ordinary, Electric Supply Corporation, and Urbans. The Westminster Electric Supply Corporation announces that it is about to change its system of supply from direct current to alternating current, and that the rate of charge for the latter will be reduced to 3¾d. per unit, as from the Christmas meter readings. This is a reduction of ¾d. per unit.

A Labour member in the House of Commons the other day asked the Minister of Transport whether his attention had been drawn to the growing influence of American capital in British electricity supply companies. Colonel Ashley admitted that he was aware that statements had been made, from time to time, to the effect that American capital was being employed in purchasing shares of companies interested in the electricity supply industry in this country. He added that he had very considerable powers under the Electricity Acts of 1919 onwards.

Business Conditions.

The manufacturing group is quiet, the outstanding feature being a rise to 43s. 9d. in General Electric ordinary. Active business is doing in the shares, but, with a small amount of supply available, the would-be purchasers found difficulty in filling their requirements. British Aluminium ordinary have recovered their loss of last week; British Insulated are easier at £4. The iron, steel and heavy industry department shows no changes worth mentioning. The rubber market continues stagnant. Interest in coal distillation and other such shares shows signs of dwindling, with the result that prices lean to the lower side. But in this, as in other parts of the Stock Exchange, the volume of business has become greatly contracted as compared with that which was being done in the markets only last month.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	Dividend. 1927.	Price Dec. 10, 1928.	Rise or fall.	Yield p.c.
Home Electricity Companies.	£					
Bournemouth and Poole	1	14†	15	8⅞	—	... ...
Brompton Ordinary	1	8⅝	8½	27/-	—	5 8 8
Charing Cross Ordinary	1	8½	8½	26/6	– 6d.	5 5 8
do. do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8½	8½	27/-	—	5 3 8
City of London	1	10	10	30/9	—	4 16 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	39/6	—	4 1 0
County of London	1	7½	7½	43/6	—	3 9 1
do. do. 6% Pref.	1	6	6	23/6	—	5 2 3
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	52/3	—1/-	4 4 3
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/-	—	5 0 0
London Electric	1	8½	8½	26/6	—	5 5 8
Metropolitan	1	8	9	45/-	+2/-	4 0 0
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/6	—	4 5 0
Mid. Elec. Power	1	—	15	2	—	... ...
Newcastle-on-Tyne Ordinary	1	5	6	25/-	—	4 16 0
do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/-	—	5 0 0
South London	1	8½	8½	27/6	—	5 2 8
Urban Ordinary	1	7	7	37/3	—1/-	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	34/-	—	4 14 1

†4% of which was tax free.

Home Rails.						
Central London Ord. Assented	Stock	4	4	79	—	5 9 7
Metropolitan	,,	3	3	64½	—	4 13 0
do. District	,,	3½	4	80½	—	4 19 5
Underground Electric	£1	1½	5	27/-	+6d.	3 14 1
do. do. Income	Bonds	6	6	127	—	4 16 0
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
do. Def.	,,	1½	1½	24⅝	—	6 2 0
Automatic Telephone	1	10	10	2⅛	—	4 14 1
Eastern Extension	10	10	10	26	+⅛	*3 17 0
Eastern Tel. Ord.	Stock	10	10	202	+6½	*3 16 4
Globe Tel. and T. Ord.	10	10	10	25⅜	+⅛	*3 18 2
do. do. Pref.	10	6	6	11⅛	—	5 8 1
Great Northern Tel.	10	20	20	28½	—½	... ...
Indo-European	25	10	10	47½	—	*5 5 8
Marconi	10/-	5	*10	3⅞xd.	—⅛	... ...
Marconi-Marine	1	8½	12½	3⅛	—1⅛	3 17 0
Oriental Telephone Ord.	1	12	12	3⅛	—	*3 18 0
United R. Plate Tel.	5	8	8	10⅜	+16/3	*3 18 5
Western Telegraph	10	10	10	26xd.	+⅜	3 17 0

*Interim.

Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	5	5½	5½	8½	—	7 9 3
do. do. 2nd. Pref.	5	6	6	9½	—	8 11 6
do. do. 5% Deb.	Stock	5	5	77	—1	6 9 10
British Electric Traction Def. Ord.	,,	—	—	595	+10	... ...
do. do. Pref. Ord.	,,	8	7½	124	—	5 19 0
Brazil Traction	100	6	7	70	—6½	2 10 1
Brit. Colombia Elec. Rly. Pce.	Stock	5	5	96½	—	5 2 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	12/-	—	... ...
London United Tram Deb.	Stock	4	4	62	—	6 9 1
Mexico Trams, 5% Bonds	—	5	5	60	—1	6 5 0
Mexican Light Common	100	Nil	Nil	81	—	... ...
do. 7% Pref.	100	Nil	7	76½	—2	9 3 0
do. 1st Bonds	—	5	5	77	—	6 10 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

Manufacturing Companies.						
Babcock & Wilcox	1	13	15	67/-	—	*4 9 9
British Aluminium Ord.	1	10	10	43/9	+9d.	*4 11 4
British Elec. Transformer Pref.	1	7	7	18/-	—	7 15 6
British Insulated Ord.	1	15	15	4	—⅛	3 15 0
Brush Ord.	1	10	10	28/9	—	6 19 3
Callenders	1	15	15	4	—	3 15 0
do 6½% Pref.	1	6½	6½	1⅞	—	5 4 0
Crompton Parkinson Ord.	£/-	—	—	20/6	—	... ...
do. 8% Pref.	1	—	8	25/-	—	6 8 0
Edison-Swan	£/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	26/9	—	5 12 1
Enfield Cable Ord.	1	20	20	4⅝	—	4 6 7
English Electric	1	Nil	Nil	7/6	—	... ...
do. do. Pref	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	2⅜/6xd.	– 9d.	5 10 8
do. Ord.	1	7½	10	43 9	+2/9	4 11 4
Henley	1	25	25	1⅝	—	4 9 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 8
India-Rubber	1	Nil	Nil	1⅛	—	... ...
Johnson & Phillips	1	12½	10	38 9	—	5 3 3
Met.-Vickers Ord.	1	8	6	28/0	—	... ...
do. Pref.	2	8	8	2⅝	—	5 16 5
Siemens Ord.	1	7½	7½	26/3	—	5 14 2
Telegraph Construction	12	10	10	25	—	*4 16 0

*Dividends paid free of Income Tax.

New Electrical Schemes before Parliament.

A Brief Summary of Notices which have appeared in the *London Gazette*.

WE publish below a list of proposals of an electrical nature that will come forward in the 1928-29 session of Parliament. Readers who are desirous of obtaining further information will find the notices published in the *London Gazette* for November 23rd and 27th.

(a) Electric Light and Power.

Aldershot Gas, Water and District Lighting Co.—Provision that electricity undertakings transferred or acquired by the company be part of the undertaking of the company for financial purposes, &c., and that the Electricity Commissioners may authorise the company to raise capital, &c., on the security of the company's undertaking; powers to supply electricity to premises partly within and partly outside the limits, &c.

Derbyshire and Nottinghamshire Electric Power Co.—Powers to increase the company's capital, additional borrowing powers, powers to enlarge the company's existing generating station and works, powers to supply electricity in bulk in adjoining areas, further electricity provisions, &c.

Lancashire Electric Power Co.—Additional capital and borrowing powers, further powers in connection with the supply of electricity, &c.

Stoke-on-Trent Corporation.—Extension of the Corporation's area of supply of electricity so as to include the added area and the exclusion of the added area from the area of supply of the Stone U.D.C., &c.

Yorktown (Camberley) and District Gas and Electricity Co.—Powers to charge different prices for electricity in the different parts of the company's existing area of supply, &c.

London and Home Counties Joint Electricity Authority.—Transfer to the authority of all rights of local authorities to purchase electricity undertakings, within the authority's proposed extended district; supply of electricity for the purposes of undertakings purchased; extension of authority's district to include the whole of areas supplied within that district; variation of periods and terms of purchase; alteration of constitution; financial powers; division of district into distribution areas, &c.

Grimsby Corporation.—Powers to supply electricity for ships' use and other purposes in connection with the new dock undertaking of the Corporation, &c.

Chester Corporation.—Further provisions with regard to the electricity undertaking and the supply of electricity; powers to run omnibuses within and outside the city, abandonment of the tramways, &c.

Eastbourne Corporation.—Further powers with regard to the electricity undertaking, &c.

Ilkley Urban District Council.—Further powers with regard to the electricity undertaking; financial powers.

(b) Electric Tramways, Motor-'buses and Trolley Vehicles.

London County Council.—Co-ordination of passenger traffic agreements between London County Council and others owning or working tramway, light railway, trolley-vehicle or omnibus undertakings in the London Traffic Area, with reference to management, &c., establishment of common fund, appointment of advisory boards, &c.; powers to construct new tramways in the boroughs of Poplar, Lewisham, and Woolwich, &c.

Chatham and District Light Railway Co.—Discontinuance and abandonment of all or some of the company's existing tramways, powers to run omnibuses, &c.

Leamington and Warwick Electrical Co., Ltd.—Powers to provide and run trolley vehicles in the boroughs of Warwick and Royal Leamington Spa; powers to run omnibuses; discontinuance and abandonment wholly or partly of certain tramways, &c.

South Lancashire Tramways Co.—Powers to run trolley vehicles on routes of tramways and light railways; abandonment of existing tramways; powers to run omnibuses; other general powers with regard to trolley vehicles and omnibuses; additional capital, &c.

Mexborough and Swinton Tramways Co.—Powers to run omnibuses on the routes of the existing tramways or some of them and the existing trolley vehicle routes of the company; powers to provide for the postponement of the dates at which the tramway or trolley vehicle undertakings of the company may be purchased by or vested in any local or other authority, &c.

Halifax Corporation.—Powers to run omnibuses outside the County Borough of Halifax in conjunction with or in substitution for the running of tramcars, and powers to discontinue or abandon any tramway. Alteration of the respective areas for the supply of electricity by the Corporation and the Electrical Distribution of Yorkshire, Ltd.; further financial provisions.

Cheltenham and District Light Railway Co.—Powers to provide and run trolley vehicles in the Borough of Cheltenham, the Urban District of Charlton Kings, and the Rural Districts of Cheltenham and Winchcombe on which the light railways of the company are situate, and also along certain other routes in the County of Gloucester; discontinuance and abandonment wholly or partly of company's light railways; powers to run omnibuses, &c.

Mansfield and District Light Railway.—Powers to provide and run trolley vehicles in the Borough of Mansfield, the Urban Districts of Mansfield Woodhouse, Sutton Ashfield, and Hucknall-under-Huthwaite, and the Rural Districts of Southwell and Skegby; provision and running of omnibuses; discontinuance and abandonment wholly or partly of company's light railways, &c.

Tyneside Tramways and Tramroads Co.—Power to discontinue and abandon wholly or partly the existing tramways and tramroads of the company; powers to run omnibuses, &c.

Jarrow and District Traction Co., Ltd.—Powers to abandon railways constructed under powers of the Jarrow and South Shields Light Railways Order, 1901.

Birmingham Corporation.—Further provisions with reference to the tramways, trolley vehicle and omnibus undertakings, financial provisions, &c.

Derby Corporation.—Further provisions with regard to the omnibus and tramway undertakings of the Corporation, financial provisions, &c.

Manchester Corporation.—Construction of additional tramways in the city.

Southport Corporation.—Further provisions with regard to the tramway and omnibus undertakings of the Corporation; further provisions in regard to the Corporation's electricity undertaking, including the supply of electricity in bulk and the transfer of the undertakings, financial provisions, &c.

Pontypridd Urban District Council.—Powers to provide, equip, and work trolley vehicles; abandonment and discontinuance of certain tramways; provision of omnibuses; financial provisions, &c.

Nottingham Corporation.—Construction of new trolley vehicle routes, financial provisions, &c.

(c) Railways.

London Underground Railway Companies.—Co-ordination of passenger traffic agreements between City and South London, Central London, London Electric and Metropolitan District Railway Companies and London General Omnibus Co., and other parties, with reference to management, &c., of transport undertakings in London area; establishment of common fund and payments into and out of that fund; the appointment of an advisory board, &c.

Metropolitan Railway Co.—Widening the company's extension line from Baker Street to Aylesbury and beyond, enlargement of tunnels, further financial provisions, &c.

Awards to Inventors.

There were unusual features in a claim made by Commander C. H. Rolleston, R.N., to the Royal Commission on Awards to Inventors at the Law Courts on November 26th, says *The Times*, in respect of a system of wireless control of gunfire in the Navy. Commander Rolleston did not appear, and was not represented. Mr. Justice Tomlin, who presided, said that if any part of the case was reached which ought not to become public the Commission would take it *in camera*. In an ordinary court a claimant who did not appear and was not represented would be disposed of very promptly, but he felt it a little difficult to deal with the case in that way. Mr. Swan said that the Crown claimed that H.M.S. *Vernon* was engaged on wireless control of fire some time before the receipt of Commander Rolleston's report.

A Trade Survey.

WE were favoured last week just as we were going to press with proofs of a very lengthy *Trade Survey*, dated December, 1928, issued by the Economic and Statistical Department of the British Electrical and Allied Manufacturers' Association. We regret that owing to the extreme pressure upon our space just now we are not able to quote this statement at such generous length as we might desire, but we may indicate broadly its contents and conclusions, and suggest that those who have not received a copy in the ordinary course and are interested in the survey should obtain one from the Department at 36, Kingsway, London, W.C.

In their review of the general economic position the authors first refer to the optimistic opinion which they expressed in their 1927 survey, and state that consideration of what has happened since the first quarter of 1928 has led to "modification" of that opinion. They then proceed to deal with what appears to be really the main theme of the Survey, namely, a statement of what they consider to be reasons for holding a "full stage" inquiry into financial policy. The subject of the inadequacy of the support given by the existing banks to industry is many years old, and the need has been expressed again and again for industrial banks to be established in which industries and financial authorities could unite, as in other countries, to provide facilities. Industry has from time to time made a demand for a revision of our national financial policy, and it will be remembered that eighteen months ago Mr. McKenna delivered a speech on the matter at a luncheon called by the British Engineers' Association (ELEC. REV., June 24th, 1927). The *Trade Survey* before us holds that the time has now come for holding the aforesaid "full-stage inquiry" "if only to discover whether banking policy has been directly responsible for the present state of industrial depression or not." In view of the prominence that this particular matter receives, we think it will be useful to quote below a brief extract of the official comments thereon, together with the criticisms offered by the City Editors of *The Times* and the *Financial News*.

The Survey Summarised.

It is shown that credit restriction affects the basic industries most on account of their slow capital turnover and long-period contracts. The disparity between wholesale and retail prices is blamed for high production costs, as wages cannot come down to the level reached by the price of the manufactured product. Fixed charges remain at a high level, in spite of the fall in prices brought about by deflation. Deflation, which continues, precludes manufacturing for stock, which again adds to manufacturing costs and reduces competitive efficiency. Although industry finds it difficult to obtain bank advances, there has been a steady export of capital from the country, much of which has been used to strengthen the hands of our competitors. The effects of reparations in kind are commented on, and it is shown how the delivery of part of a contract under the reparations scheme has been used as a means of obtaining the whole of the contract. So far as France is concerned, it is maintained that in such cases as the recent arrangement for the electrification of a further stretch of the Midi Railway this constitutes a direct penetration of a market in which British firms were interested. Dealing with electricity supply industry, the Survey states that since the first quarter of this year the rate of expansion has slowed down. It is suggested that the statement that domestic development has been satisfactory may be disputed. In any case, it is useless to say that the growth of domestic and commercial electrification has been so great that the supply industry has ceased to be affected by industrial developments. Now that the house-building boom appears to have ended it will be possible to discover how much of the domestic increase was due to this and how much to intensive development. After dealing with the relief of the threatened shortage of generating plant by the decrease in the rate of expansion, the Survey says that there are indications of an increased volume of orders for heavy generating plant. Reference is made to the contracts placed by the Central Electricity Board. Although, it is said, there has been an actual decline in orders for heavy plant, this has been made good by the virtual elimination of foreign competition. The electrical industry is probably in a stronger competitive position now at home than in any previous year, but the reduction in prices has practically taken away all profit margins. In the next section it is shown how well British generating plant compares with the American in efficiency and cost, actual figures of fuel consumption being quoted. Next, the developments in the international sphere, in the direction of the financing and acquisition of power undertakings by foreign capitalists, are dealt with. These movements are regarded as unfavourable, on the whole, to the British electrical export position, and it is shown that already the relative position of Great Britain has worsened. The need for co-operation at home is insisted on, and a weakness on the selling side of export business is pointed to. The Survey concludes with a forecast based on the foregoing study. In the course of this it is stated that there are few signs at the moment of a real improvement in the home market in this country, even although the worst period of depression this year has been passed. The usual seasonal revival is less marked, and enterprise is becoming less active. The future depends almost wholly on the financial policy which will be carried out in this country, and, unless a change does take place in it, it is difficult to see how depression can be avoided. The upward movement in trade, which began in the first quarter of this year and might have been expected to continue throughout the year if it had not been interrupted, may be deferred until next year. The reduction in financial resources and the elimination of profits caused by the depression ruling in 1928 will affect industry practically all through 1929, and will be a factor damping down any sudden movement towards expansion.

Criticisms from the City.

We quote the following observations on financial policy from *The Times* City editorial notes of December 5th:—

Trade Survey, described as "a quarterly international study of trade conditions, prepared by the economic and statistical department of the British Electrical and Allied Manufacturers' Association," has discovered the real and simple cause of industrial depression. It appears that in its previous issue, which covered the year 1927, it anticipated that the year 1928 would be a period of consistent progress, but it has now had to modify its optimistic opinion, the reason given being that its prophecy was upset by the financial policy of the Bank of England. It does not appear to have occurred to the prophet that he may have misread the economic situation. The *Survey* says:—

"It is already quite evident that the financial policy of the Bank of England, approved, as we presume, by the Government, has been a very powerful factor interfering with the normal growth of business, and has been directly responsible for the state of depression which has ruled in this country since March. If the credit and financial position had been at all adequate to the needs of the present time, and if industry had received from banking interests the full support it required for the first movement of expansion, there is no doubt that 1928 would have been one of the most prosperous years that have occurred since the conclusion of the war. . . . What are the factors making for disturbance of trade conditions and for lack of competitive efficiency? The principal among them may be summarised under the heads: (1) Labour disturbances; (2) excessive costs of production leading to high prices; and (3) lack of enterprise in developing export trade.

"Now the unemployment and the foreign trade returns, as well as the course of prices in essential industrial materials and products, show that, during 1928 (1) there have been no labour disturbances; (2) in the majority of industries the prices now quoted are on a genuine international level and are not an obstacle to trade; and (3) the exports of finished products, at this time of unequalled depression, show a high figure this year. The conclusion forced on us, therefore, is that, in relations between capital and labour, in price movements, and in the export position, any changes that have occurred have been greatly in favour of increased trade, but this trade has not materialised. We must look elsewhere, therefore, for some explanation of this phenomenon of trade depression, which has apparently fallen from the skies. . . . The trade depression, which at one time was confined to what are regarded as export industries, has spread to other industries which depend on home consumption. For the first time, therefore, since 1921 the crisis is entirely one of home consumption, and it has little or no relation to the international trade position.

'In short, we are confronted with a real decline in the purchasing power of the public generally, and this decline has affected every industry without distinction, electrical manufacturing not excepted. There can be only one explanation for such a narrowing down of the home demand, and it is to be found undoubtedly in the financial situation, and is to be attributed to the credit policy pursued by the Bank of England since the spring of this year."

The Times here ends its extracts, and, resuming its editorial criticism, says:—"Unfortunately the Survey does not explain what difference in the credit policy of the Bank of England has been made since the spring. Indeed, in a later passage the Survey states that the policy was initiated as long ago as the autumn of 1920. So far as we are aware there has been no change in credit policy, and if, as the Survey suggests, it has been in operation eight years, how was it that the Survey did not take it into account when it made its optimistic forecast for 1928? Meanwhile, let us look at the facts of the credit situation, and compare them with the facts as they existed a year ago. The advances of the ten London clearing banks now amount to £953,780,000, an increase of £20,424,000 in the past year; indeed, it is necessary to go back several years to find a comparable figure. The turnover of the London Bankers' Clearing House down to last week

showed an increase of £2,318,821,000 on that of last year, and as last year's figure was an unprecedentedly large one, this year's figures represent a higher record. The Bank of England's reserve is £20,080,933 higher than it was a year ago, and as for nearly two years the Bank has been able to keep its discount rate at a constant level of 4½ per cent., in spite of the fact that money rates in some of the principal international monetary centres have been rising, it seems difficult to accuse the Bank of having pursued a policy inimical to British trade. The issues of new capital have this year been larger than in any post-war year with the exception of 1920, but as the value of money in that year was less than half of what it is to-day, this year's emissions of capital may be regarded also as a record. If we might venture an opinion with regard to the growth of credit and of capital issues it would be to suggest that the public has lent not wisely, but too well, for no complaints have reached us from those obviously entitled to it of inabilty to obtain capital or credit."

From the *Financial News* of December 6th we quote the following short leader bearing the title "Is Credit Restricted?":—

"Although the criticisms of the Bank of England's policy contained in the Trade Survey published by the British Electrical and Allied Manufacturers' Association excited a good deal of interest in the City to-day, there were few who were inclined to subscribe to the views put forward. It is significant that bankers themselves, who are well placed in estimating the demand for credit, should almost unanimously believe that the demand is being adequately met. In fact, the plea put forward in the "Survey" was generally regarded as little more than a veiled demand for inflation. Without disputing the relevance of the monetary factor in any discussion of our industrial ills, one may point to other influences which must surely be given great weight. One is the inevitably disturbing effect of industrial readjustments of various kinds, readjustments connected with rapid changes in demand. Another is the growth of manufactures in countries which previously provided outlets for our goods. As a great exporting nation, we stood to lose more than any other country from the dislocation of world trade which followed the war. To attempt, in face of these considerations, to explain our industrial ills in terms of monetary policy is obviously to run into error."

Modern X-Ray Apparatus.

A survey of the electrical equipment necessary for modern work, more especially in relation to industrial applications and the examination of materials.

By L. G. H. SARSFIELD, M.Sc., A.M.I.E.E.

(Extracts from Paper read before a joint meeting of the INSTITUTION OF ELECTRICAL ENGINEERS *and the* BRITISH INSTITUTE OF RADIOLOGY.)

(Concluded from page 1001.)

Typical time/temperature curves for Miller transformer coils are reproduced in fig. 5, and the fig. 6 curves of temperature-rise at 85 mA plotted against a number of layers afford practical evidence in connection with the thermal resistivity of dielectrics, a subject which received attention in the E.R.A. "Report on the Thermal Resistivity of Dielectrics" (I.T/13).

Small secondary coils of rectangular section having layers parallel to the axis are used extensively; they are made with paper inter-layer insulation varnish-impregnated and baked, and provide perhaps the best oil-resisting mechanical job.

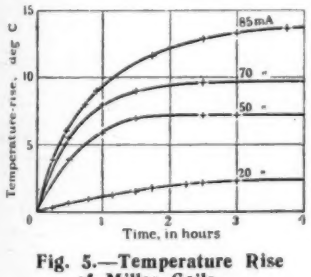


Fig. 5.—Temperature Rise of Miller Coils.

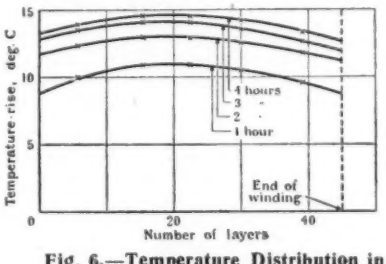


Fig. 6.—Temperature Distribution in Miller Coil.

The multiplicity of insulating pieces can be avoided by a method now being tried out by the author in the Radiological Research Department. It makes use of triangular-sectioned coils wound on the "cross-over" plan, the halves being supported on insulating rings [fig. 8 (*a*) and (*b*)]. The winding layers of this type of coil are parallel to the axis and are of increasing length from the inside diameter outwards. The coil may, of course, be varnished, impregnated and baked. This shape of section permits the coils to be stacked touching one another without spacers, or barriers, between them, and gives a maximum electrical clearance where there is a maximum potential difference, and none where there is no potential difference. An additional advantage is that there is practically no potential difference in the coil where it is in contact with the main cylinder. Compared with some methods of winding, this scheme also affords a saving of space on the total length of winding window.

While in the early days little attention was given to transformer bushings, it is a significant fact that sound engineering principles are being established in reputable equipment of the present time. One English manufacturer has standardised the use of condenser-type bushings made by insulation specialists, fitted in the metal tank cover. A German firm uses an oil-filled design, while in America ebonite and moulded insulators are in successful operation. A type of bushing in extensive use in the Radiological Research Department was developed mainly because of its cheapness and simplicity of construction. The central conductor is a brass tube and the bushing consists of ebonite tubes shrunk one over another and mounted in a disk of the same material. On either side of the disk are ebonite collars that displace the air, or oil, which, if present, would be highly stressed owing to the density of the electrostatic field in that region. The distance between the ends of the bushing and the edge of the disk over the surface of the ebonite bears as large a ratio as possible to the distance between the same points directly through the air, or oil; the diameter of the central conductor is so chosen that at operating voltages corona does not form. Should the air films between the ebonite tubes become semi-conducting under high stress they will act as unipotential "surfaces," and part of the bushing therefore tends to function as a condenser-type arrangement. A set of six has been in constant operation at 140,000 volts (peak); the spark-over voltage is 250,000 volts (peak).

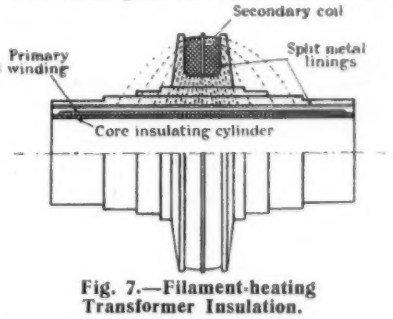


Fig. 7.—Filament-heating Transformer Insulation.

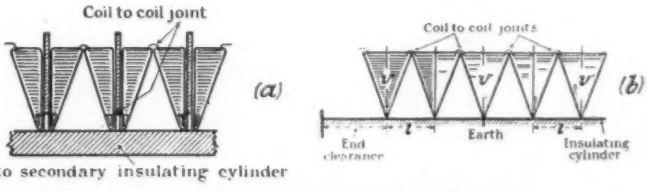


Fig. 8 (*a*) and (*b*).—Diagrammatic Sections of Coils.

Filament-Heating Transformers.

The filaments of X-ray tubes require up to 5 amperes at 12 volts, while the filaments of rectifying valves generally work at 7-10 amperes for about the same drop of potential. The maximum output demanded of a filament transformer for X-ray work is of the order of 100 volt-amperes. Great

accuracy of ratio is unnecessary, since filaments vary and adjustment can easily be made by resistances. A method of construction which has been in use in the Radiological Research Department for a number of years and has given every satisfaction is shown in fig. 7. The insulation consists of a number of tubes shrunk one over another in the manner already described for terminal bushings. The graded thickness is a maximum in the centre, where an annular trough of the same material as the tubes is arranged to receive the secondary turns. The shape of the insulation confines the densest part of the electrostatic field to the solid dielectric, while the oil is only traversed by the longer lines of the electric field. A split lining of metal foil in intimate contact with the inside of the trough and connected to the centre of the secondary winding avoids any of the main electrostatic stress being taken up by the oil in the trough, and also aids uniform distribution of this stress through the solid material. A split metal liner is fitted inside this composite insulating system. The secondary coil is wound on the cross-over plan and the leads are brought out of the trough through a bushing like those already described.

Rectification.

When cold-anode self-rectification is not relied upon, valves are now extensively used in X-ray equipments of all kinds. Although they are much cheaper, gas discharge tubes, owing to their unsteady operation, have largely given place to the hot-kathode type, which, when used under good conditions, gives uniform and reliable working, and therefore warrants the extra expense of filament-heating transformers. For most purposes half-wave rectification is sufficient.

As many as 10 kenotrons have been used in series for 400,000 volts to earth on cable-testing equipments in America.

One disadvantage is the initial high cost and the expense of replacements. In contrast, hot-kathode valves have been in use four years continuously without trouble. Rectification by mechanical means has been widely taken up; common devices are the Snook arrangement and Lemp disk. The part of the voltage wave near its maximum value is most useful for X-ray penetration, therefore the tube circuit need only be closed during a comparatively small fraction of the period. A common value for this fraction is ¼. It seems desirable, however, for heavy-current (30-50 mA) high-voltage working to increase the contact period. The subject requires detailed investigation.

At Woolwich a single-disk rectifier for 320,000 volts (peak) with four stationary collectors now in operation in the Radiological Research Department is believed to be the largest of its kind. It consists of a "Paxolin" (bakelite varnished paper board) disk 50 in. diameter, ¼ in. thick, stiffened at the centre by two similar disks 18 in. diameter, and mounted on a central flanged steel sleeve which is keyed to the driving motor shaft. The metal segments are of inverted U section, and slide over the edges of the disk. The brushes are of new design, combining the absence of corona with definite contact, by enclosing each brush almost completely in a hollow sphere. The brush is allowed to project about ½ in. at one place through a slot cut with its length in the line of rotation, set to trail and sprung to bear on the metal segments. The segments are of "Staybrite," and therefore resist abrasion and corrosion. The brushes are carried on insulating arms fixed to a ring clamped on to the end shield of the driving motor.

Special Equipment.

Although some portable apparatus is provided with special foolproof features, little can be said for the safety and rigidity of the average equipment of this sort.

A portable set of unusual character, patented by Coolidge, is of great interest because of its very small size and consequent lightness. A specially developed X-ray tube is immersed in oil in the same tank as the X-ray transformer. The tube (only 4 in. long) operates at 56,000 volts (peak) and 10 mA, and the filament is heated by 5.7 watts. The dimensions of the unit are 10 in. by 7 in. by 6 in., and it weighs 26 lb. The whole of the high-voltage system is enclosed in an earthed metal case.

Mobile equipment constructed in the Radiological Research Department with a view to its being of service for the examination of materials employed in aeroplane construction is fully described and illustrated in R.D. Report No. 84.

Other equipment recently installed for Service radiography is interesting, chiefly because the difficulty of arranging details so that one man could operate the set was finally overcome by the combination of a time switch with a switch for turning on the X-rays, made up like a d.c. motor starter.

Conclusion.

Desiderata of a few years ago are now accomplishments. It may be that for the highest-voltage X-ray work of the future there will be a reversion to some improved form of induction-coil outfit. The latest experiments include the use of voltages up to 1,000,000, and also of rapid discharges from condensers for energising X-ray tubes; rapid discharges represent a minimum of exposure time, and therefore make for better radiography of objects which cannot be held still.

A good deal remains to be done on the development of simple control apparatus to include automatic and safety features, so that the adoption of X-rays in industry may not be hampered by the necessity for laborious manipulation of switches nor by the risk of any breakdown of the high-voltage system involving the operating gear. In the case of the large equipment at Woolwich, which is capable of working up to 400,000 volts (peak), the latter contingency has been guarded against by solidly earthing the operating handles and interposing heavy insulation between them and the controlled primary circuits.

Electricity Generating Plant.

A Brief Review of Some of the Recent Developments which are in Progress.

By J. HARCOURT WILLIAMS, M.I.E.E.

(*Extracts from Chairman's Address before the* NORTH-WESTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS *at Manchester.*)

THE boiler house is undoubtedly going through greater changes at the moment than any other part of the generating station, due to increased pressures and temperatures, pulverised-fuel firing, compartment-type stokers, and air heating; also low-temperature carbonisation plant results are now being published.

High steam pressure and temperature have undoubtedly increased complications, particularly in the boiler house, as additional apparatus is needed in order to make full use of them; if some stations have not obtained the results that were expected from theoretical considerations, one is inclined to attribute their absence to the complications which they introduce, and one must remember that each link means possible inefficiency and increases the necessity of adequate supervision in order to ensure the best results. One expects that complete success will come when more experience has enabled the plant to be simplified; it is worth noting that the Padiham station in Lancashire is obtaining results on a par with those of the Barton plant, although operating at a very moderate pressure and temperature, but laid out on extremely simple lines.

Boilers.

Boilers are still increasing in size, notable ones being those of the Manchester Corporation, Barton, 130,000 lb. per hour; County of London E.S. Co., Ltd., Barking, 135-187,000 lb.; Liverpool Corporation, 125,000 lb.; Birmingham Corporation, Hams Hall, 200,000 lb.; Leeds Corporation, 160,000 lb.; Synthetic Ammonia & Nitrates, Ltd., Billingham, 240,000 lb. per hour.

Pulverised-fuel installations continue to make headway in this country, and the direct firing, or unit, system is gradually establishing itself as the more practical. Reheating has been tried in America and in this country, but for the moment it appears to be resting; it may be revived later if increased steam temperature does not render its use in the future of no advantage.

Steam Turbines.

The tendency has been for size to increase, and the Central Electricity Board has standardised 50,000-kW (c.m.r.) sets for station extensions in England and Scotland. In America very large sets are being installed, such as the following: 208,000 kW for the State Lines Generating Co., 165,000 kW for the Ohio Power Co., Philo., and 160,000 kW for the New York Edison Co.

The capacity of 50-cycle turbo-alternators running at 3,000 r.p.m. continues to increase, as the limit is no longer the ventilation of the electrical rotor, but rather a mechanical one. Makers are now building sets of from 35,000 to 40,000 kVA to run at 3,000 r.p.m., and it is probable that even they will soon be exceeded. Many engineers still favour, however, 1,500-r.p.m. sets, and 70,000-kW sets and over are likely to be built shortly in this country. All large modern sets are multi-cylinder, either in tandem on one shaft, or on separate shafts driving separate alternators: the two-cylinder machine has been rather overdone, apparently due to fashion,

or a desire to offer something out of the ordinary, and this applies to the smaller capacity machines down to 5,000 kW at 3,000 r.p.m. Increasing the number of stages in order to show a slight gain in efficiency is offset in turbines of the multi-cylinder design of such small ratings by the cross-over pipe losses, extra gland leakage loss, and bearing losses. There is an undoubted tendency in America for engineers who previously advocated two- or three-cylinder types to show a distinct preference for still larger turbines of the single-cylinder design; two recent examples are the 75,000-kW, 1,500-r.p.m. set for Buffalo and the 75,000-kW, 1,800-r.p.m. set for the Cahokia station of the Union Electric Light & Power Co., St. Louis.

Turbine designers are now looking to much higher steam temperatures to effect increased economies, and my company is now building to an order a 10,000-kW turbo-alternator to which steam will be supplied at 365 lb. per sq. in. at 1,000 deg. F. by a boiler operating at 400 lb. and 700 deg. F., from which it will pass through an independent oil-fired superheater; the machine is designed to work at a 29-in. vacuum. The high-temperature portion of the machine is in one cylinder and made of special alloy steel, the machine being a two-cylinder set; the superheater will also be made of alloy steel.

Alternators.

At present machines of as low a rating as 1,500 kW can be wound for 11,000 volts. The problem of designing for high voltages is easier for larger ratings, and manufacturers are building machines of 20,000 kW and above for 33,000 volts. Modern machines call for a wide range of excitation and a separate source from which the exciter main field can be excited is desirable, and can best be provided by using a double d.c. generator, one the exciter proper, the other a small auxiliary machine designed to run at constant voltage with the magnetic field saturated, and to excite the main exciter under all load conditions; it is also available for operating the synchronising motor alarms in air-cooler equipment, or voltage-regulator coils.

The 160,000-kW, 25-cycle, set for the New York Edison Co.'s East River station is the largest single alternator built. It is a two-pole machine, and the design of the rotor, which presented several mechanical problems, was the limiting feature; the makers had to get the largest possible output out of the available space. An unusual feature about the stator is that it has two separate identical windings of 80,000 kW each, but electrically separated, being connected through two oil circuit breakers to adjacent sections of the bus-bars. The advantages of this arrangement are: (1) Possibility of obtaining half the output of the machine with one-half of the winding, and (2) reduction in the current rating of the oil switches by the use of two.

Transformers.

Voltage control by tap changing on load is not new, but only recently have satisfactory designs been produced which enable the change to be carried out directly on tappings from the main transformer. Complete parallel windings were the original arrangement, but an improved method is bridging the tap section with either a continuously-rated, or intermittently-rated, reactor, a further modification being the use of an auto-transformer instead of a reactor. The most up-to-date practice employs a double ratio adjuster, and is superior for large outputs at high voltage to the parallel winding or multi-contactor systems; ratio adjusters make the physical change from one tap to another, and oil-immersed contactors break the current.

High-voltage windings insulation reinforcement is now giving place to static shields, which will enable the cost of the insulation to be reduced without reducing the safety factor. This device takes advantage of the fact that at ordinary standard frequencies the capacity and inductance of a transformer windings are in a stable condition. A sudden increase in the frequency due to a surge, or similar cause, tends to produce uneven voltage distribution through the winding, but static end-shields tend to ensure uniform distribution. It is now possible to produce very large windings of the disk-coil type without a single joint throughout their entire length. The largest coil of this type ever produced has recently been made in England for transformers in the Manchester district, and has a rating of 16,000 kVA.

A notable recent advance is the use of air jets principally with radiator-type self-cooled transformers, the scrubbing action increasing convection and radiation; as much as 40 per cent. increased output over and above the self-cooled rating has been obtained by the application of jets to stir up the air in contact with the radiators, which is quite different to air-blast cooling, and a much smaller volume of auxiliary air is required to obtain the same effective cooling.

A transformer of 100,000 kVA which is being built in Berlin will be the biggest in the world; it is of the five-legged type with three legs wound. It is unlikely that a transformer larger than 30,000 kVA, three-phase, 132 kV, could be transported in its own tank; such a design has already been completed, and meets all the requirements of the specification to which such transformers are to be built. Within the next few months there will be installed in the Manchester neighbourhood the largest single-phase self-cooled transformers built in Great Britain, and will embody many of the developments outlined above.

High-voltage Switchgear.

There is no alternative but to put 132-kV switchgear out of doors; to eliminate extensive and expensive structural work, it can be floor mounted by putting the isolating switches on concrete columns, 8 to 9 ft. above the floor level. Generating station isolating switches should be motor operated, particularly when they are used as selector switches, although it would be much better practice to use duplicate oil switches, at least in the generator circuits. The current transformers should be of the bushing type, and for synchronising and potential indication either capacitance transformers can be used, or, alternatively, potential transformers on the low-voltage side of the power transformers. It is generally agreed that, when possible, high-voltage potential transformers should be avoided, so that it is likely that metering the load will be carried out on the low-voltage side, the potential transformers being arranged so as to compensate for the regulation of the main transformers.

For 22- and 33-kV stations there is the cellular indoor type, metal-clad indoor type, ordinary outdoor type, and now outdoor metal-clad types of switchgear. Outdoor metal-clad oil-filled gear has come into prominence in the United States, two large installations being those at the Northern Illinois Public Service Co.'s Wheaton sub-station and State Line power station. The main features of this gear, which operates at 33,000 volts, three-phase, 60 cycles, are that the main and hospital 'buses, oil circuit breakers, and instrument transformers are all enclosed in metal and mounted on a steel structure, and in consequence no live parts whatever are exposed, and it can be thoroughly painted like any other outdoor steel structure without any risk to those so engaged. The control panels are mounted indoors in the usual manner. This particular gear has duplicate oil switches, and is designed with the idea that any trouble on one bus-bar, or oil switch, will not affect the other. Each section is fitted with an oil conservator identical with those used on transformers. The lead-covered feeder cables are connected to the current transformers, which are, in turn, joined to the common connection, at each end of which are the two oil switches. The bus-bars and connections are copper tubes wrapped with bakelised paper, and supported in an outer copper tube by bakelised-paper insulating spools, suitably cut away to allow oil to circulate; expansion joints are provided on the outer copper tube coverings, and oil leakage from any part is limited, the insulation being such that it will stand up to the working pressure without oil. The oil switches are of the vertical plugging type.

"Grid" Switchgear.

The Central Board's sub-station switchgear on order for the Scottish "grid" is of the outdoor type floor mounted, with a minimum clearance to live metal of 9 ft. The space occupied is rather more than for the usual for lofty structures. In the case of one type (B), structures carry the duplicate bus-bars about 30 ft. above the ground. The 13 sub-stations for the Scottish scheme are of two types (that is, the A and B), and differ in their layout and number of equipments, A being the simple one with two ring feeders and two transformers so arranged that when additional feeders are added they can be converted to the B type. The oil circuit breakers have one-piece boiler-plate tanks and top plates; a manhole is provided to give access to the interior, and the tank, although standing directly on the ground, is arranged so that its bottom can be kept painted. The weight of each single-pole switch, complete with oil and bushings, is 6 tons, and the switches have a rupturing capacity of 1.5 million kVA, are fitted with explosion pots, oil-filled bushings, and are solenoid operated (hand operated in emergency), the mechanism being housed in the breaker tanks; lifting gear is provided to remove bushings and mechanism for examination.

Instrument and protective transformers are made up in the bushing form, and the isolating switches are of the three-insulator type, with the centre insulator, which carries the blade, rotating when the switch is worked; they will be mechanically operated, but can be altered for motor operation later; the contact jaws are of the floating type, and sleet hoods are provided. Line isolators are provided with interlocked earthing contacts and interlocks between the oil switches and isolators of the figured-key type. The majority of the isolators are of the built-up pin type, each consisting of four units mounted one above the other, and the strain insulators are of the cap-and-pin type.

Potential transformers will not be provided on the 132-kV gear, but each transformer will have a three-phase potential transformer on its l.p. side, with tappings connected to auxiliary contacts on the main transformer tap-changing gear, its ratio varying with that of the main transformers; there is also a patented device to compensate for voltage drop in the main transformer.

"Grid" Protective Gear.

The protective gear on the "grid" will be of two forms: (*a*) for feeders up to 12 miles in length pilot cables are to be used; (*b*) for feeders over 12 miles long, selective protection without pilots.

The pilot protection is to be the Translay system, essentially of the opposed-voltage type, involving the use of two pilots only with one relay at each end of the feeder, similar to an induction watt-meter, inherently compensating for capacity

current in the pilots and energised from three line-current transformers to be responsive to phase-to-phase and phase-to-earth conditions. Reasonable low earth fault setting will be obtained, and the gear will be proof against heavy through earth faults. High-frequency line conditions will not disturb the protection, owing to stabilising resistance connected in parallel with the coils.

The pilotless protection has been designed to be quick in action on low-resistance earth faults. A balanced induction type relay will be provided for the purpose with such characteristics that it will only operate on faults occurring within 110 per cent. of the feeder protected. The time of operation will be a constant low value throughout the greater part of the feeder length, but will go off to infinity in the 10 per cent. overlap. Arc resistances are almost negligible on high power distribution systems: a time relay will, however, be provided, the time of operation of which will vary directly as the impedance of the fault, so as to guard against non-operation due to a high-resistance earth fault. An impedance time relay will take care of phase-to-phase faults. The quick-acting definite impedance relay will be given a directional feature by an additional single-pole relay, in which the direction of flow of current up the power transformer neutral will be compared with the direction of the residual current in the line. The impedance time relay for earth faults will be inherently directional, while the impedance time relay for phase faults will have a directional element in which the phase-to-phase voltage will be compared with the line current. All the relays must have potential restraint, which must vary with the line voltage: to cater for this, potential transformers will be provided on the low-voltage side of the power transformers at each sub-station, compensated according to load conditions for the transformer reactance drop. In order to reduce the burden imposed upon the current transformers by the long lengths of multicore cable, the normal full load secondary current will be reduced to 0.5 amps.

"Grid" Transformer Protection.

The power transformers at each sub-station will be star connected on their high-voltage side, with the neutral solidly earthed. The low-voltage side will be delta connected, and an artificial earth provided by means of a Z-connected earthing transformer, which will also provide power for the small auxiliaries. Each side of the power transformer will be protected separately by overload and balanced-leakage gear.

Large Searchlights.

Two Searchlights built by the London Electric Firm are claimed to be the largest in the World.

WHAT are believed to be the largest searchlights in the world, probably developing nearly the greatest artificial light intensity ever created, of the order of 3,000,000,000 c.p., have recently been constructed by the London Electric Firm for supply to a European power for frontier defence work. Each lamp, fig. 1, has a

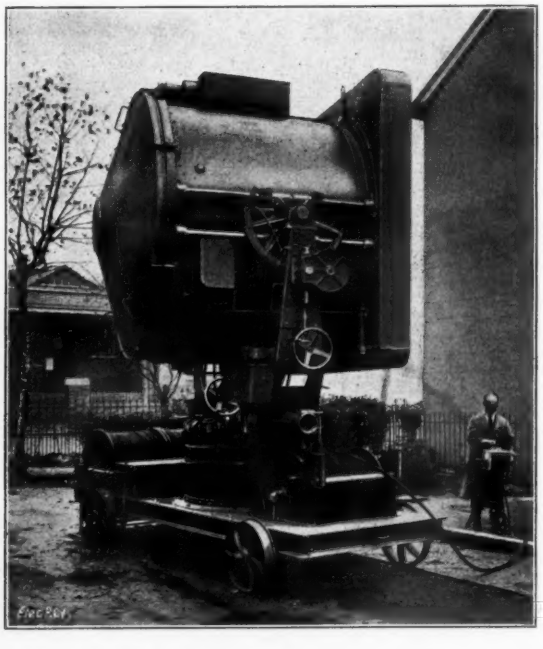


Fig. 1.—A 200-cm. Mirror Searchlight.

200-cm. mirror, and is mounted on a truck with provision for running on rails. The barrel is carried in a trunnion mounted on a suitable turntable. Slip rings and brush gear on the main trunnion shaft provide the necessary means for carrying the current to the arc and the various controlling motors. There are five small motors embodied in the equipment; one is mounted on the turntable for elevating the barrel; another, similarly positioned, drives the turntable; a third is placed in the roof of the barrel and drives a fan for ventilating the interior; a fourth motor, carried on the back of the barrel, operates the signalling shutters; and there is also a small motor in the base of the actual lamp which, through differential gearing, feeds the carbons at the correct rates and revolves the positive one. The searchlight is also fitted for pan-handle control, special interlocking arrangements being provided to cut the elevating and turning motors out of gear when the pan handle is in position. The barrel operates through 90 deg., horizontal and vertical. Local control is also provided for; a seat on the trunnion at the back of the lamp accommodates a man near the necessary operating wheels. Distant control is arranged for electrically, the control gear being carried on a tripod at the end of a 100-m. length of 10-core trailing cable. This and the main supply leads are carried on cable drums suitably mounted on the carriage. The single supply cables (200 m. each) are carried separately, and the drums are fitted internally with slip rings and brushes. An interesting feature is a small watertight fitting which illuminates the stops for the training and elevating scales.

A main d.p. switch for the arc lamp is fitted at the base of the trunnion. The lamp is carried on sliding rails in the bottom of the barrel, and can be lifted out bodily. To facilitate centralising the arc, a small inspection device is fitted in the side of the barrel; an image of the arc is projected on to a small screen, and so indicates the position of the arc proper. The feeding of the carbons may also be carried out by hand. Simple sliding arrangements are provided for replacing the carbons. The normal current taken by the arc is 200 A at an arc voltage of 78 V. The lamp is designed to work on a supply voltage of 100 V, and the supply will be obtained from an "Aster" portable generating set, one for each searchlight. Each set, fig. 2, consists of a four-cylinder, 35-h.p. paraffin engine, directly coupled to a suitable generator, with the necessary auxiliaries.

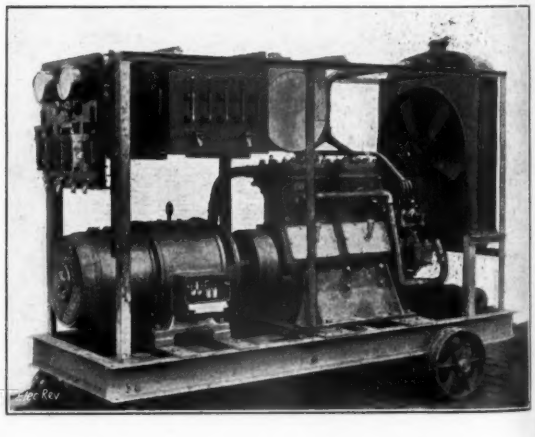


Fig. 2.—35-h.p. Portable Generating Set.

It is interesting to note that the front glass of the lamp is built up in 20 equal segments, which may be taken out separately for replacement.

The Underground Electric Railways.

The Opening of the New Piccadilly Circus Station in London.

SITUATED at the crossing of two underground railways—the Bakerloo and the Piccadilly tubes—Piccadilly Circus has always been an important station since its construction in 1906; in the early days it dealt with an annual traffic of 1½ million passengers—but the surrounding area has developed so rapidly, in great part due to the existence of the railways, that to-day it serves no fewer than 25 million passengers yearly. Naturally, the accommodation has been severely taxed; it was impossible to adapt the existing station to the new conditions, and therefore, nearly four years ago, a beginning was made with a scheme conceived on a vast scale, involving the excavation of almost the whole of the Circus to a considerable depth and the construction of a large booking hall, a lower hall, and escalators between them and from the latter to the platforms. This huge undertaking was carried out without materially interfering with the traffic, or breaking up the surface, there being little indication above ground of the activities of the contractors, save a hoarding and a crane on the island formerly occupied by the Shaftesbury Memorial fountain—the smallest area, it is believed, ever assigned to such a purpose.

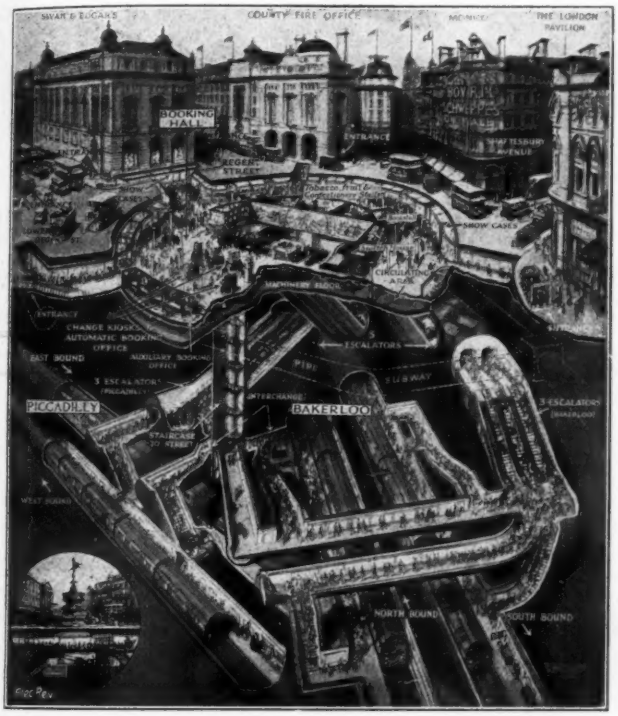


Fig. 1.—Sectional View of the new Station at Piccadilly Circus, showing the various levels, subways, and escalators. Inset, the Shaftesbury Memorial.

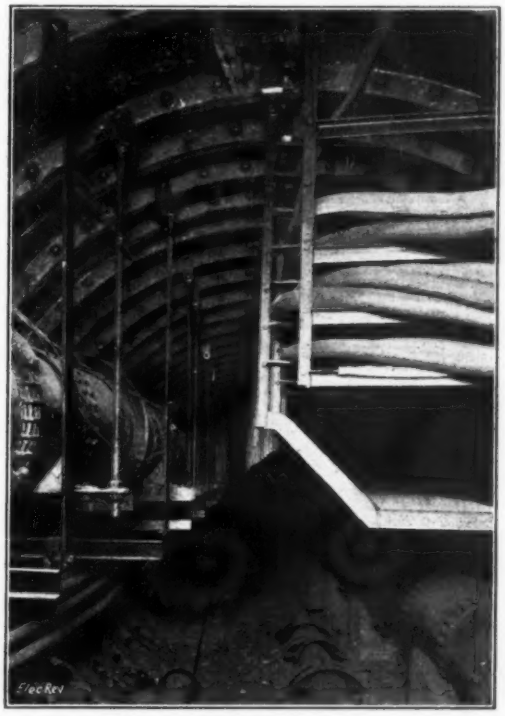


Fig. 2.—Interior of Pipe Subway. Left, Hydraulic-power Mains and P.O. Cables; right, Water Main and Power Cables.

First, a service shaft 18 ft. in diameter was sunk through 20 ft. of gravel to the clay, which, fortunately, was dry, so that the shaft could be driven down 92 ft. without the use of compressed air. This shaft, now containing the emergency staircase, was the route followed by material and plant, and excavated clay (1,000 tons a month), and from it headings were driven at various depths to facilitate the construction of the stairways, passages, escalators, and the lower hall. The concrete roadway was strengthened with steel rails, and a 12-ft. pipe subway was made to carry water, electric, and other mains, round the Circus at a depth of from 18 to 30 ft., 550 ft. in length; inclined tunnels lead from the pipe subway to the surface, and brickwork "pipe interceptors" were provided where the subway mains joined existing mains. Henceforth the roadway need not be opened to lay new mains or repair old ones. Gas mains, and a large sewer, had to be diverted and relaid.

The chief problem was the construction of the large booking hall immediately under the roadways; the soil was dug out in sections, the overburden being at the same time supported on steel roofs and girders, until the whole eventually became an elliptical chamber 155 ft. by 144 ft. in plan and 9 ft. high. This was a very difficult and delicate operation. The roof is supported by a huge grid of girders, resting on an outer wall 4½ ft. thick and on four main columns in the central area, each capable of supporting a weight of 309 tons. Fifty smaller columns round the hall can carry from 78 to 150 tons each. The work of getting the columns and girders into position through the headings was extremely arduous, but the whole was done without accident, and without any disturbance of the surface.

Fig. 3.—Sketch of Pipe Subway between Lower Regent Street and the Quadrant.

One of the greatest advantages to the public of the new

station is that it provides a means of crossing the Circus in every direction with complete safety, there being seven entrances from street corners.

Eleven escalators have been built, five running from the booking hall to the lower hall, which measures 90 ft. by 32 ft., and three to each of the railways; all the escalators are reversible, and run at 100 ft. per minute. The upper ones are in tunnels 60 ft. long; the lower ones in tunnels 22 ft. 4 in. in diameter, and 63 ft. long for the Piccadilly Tube, 26 ft. long for the Bakerloo. Each of the upper flights is driven by a 45-h.p. motor, and each of the lower ones by a 35-h.p. motor. They are 5 ft. p.m. faster than any other escalators in London, and were supplied by Waygood-Otis, Ltd., being of the "comb" type.

About 150 men were employed during the whole period; not a single accident took place. The cost of the work was £550,000, and was borne by the company; the principal contractors were Messrs. John Mowlem & Co., Ltd., and the work was done under the chief engineer for the Underground Company, Mr. A. R. Cooper, M.Inst.C.E., Mr. H. H. Dalrymple-Hay, M.Inst.C.E., being the consulting engineer.

Mention must be made of the architectural design of the station, which differs notably from that of previous examples. The booking hall consists of an ambulatory passing right round the site, open to the public, and marked off by the two rows of columns, which have been tastefully covered with terra-cotta and ornamented, each cap bearing two lamps enclosed in opal cylinders (fig. 5); the light is soft and free from glare, yet abundant, assistance being given by indirect lighting from the tops of the ticket machines. Show cases line the periphery on the north, east, and west, with marble frieze and skirting, and are very artistically designed and furnished, their concealed lighting assisting the general illumination, the excellence of which enabled the booking hall to be made only 9 ft. high and yet not gloomy. On the west is the largest subway, 20 ft. wide, and lined with showcases. Above the escalators are paintings in oil by Mr. Stephen Bone. The consulting architects were Messrs. Adams, Holden and Pearson, FF.R.I.B.A.

The escalators end close to the platforms, which are directly below the Circus; hence the walking distance will be much shortened, and the time between street and platform will be reduced by 2¼ minutes, as compared with the old *régime*.

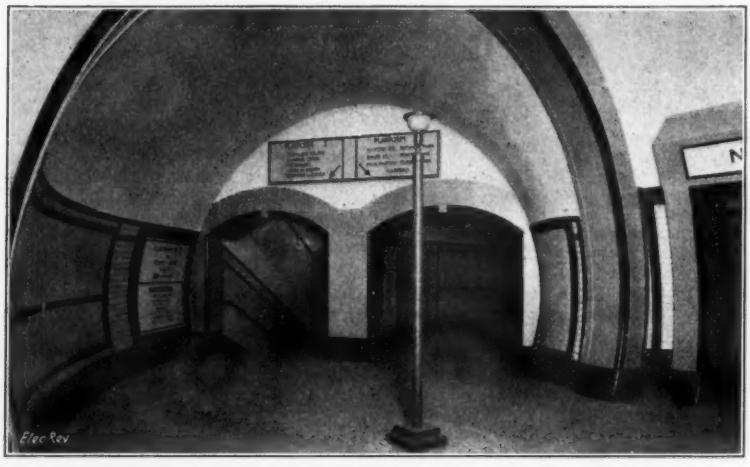


Fig. 4.—Lower Landing of Escalators to Bakerloo Line.
Lamp Standard in foreground.

Fig. 5.—Interior of Booking Hall.

Automatic ticket machines will be freely used; at present 26 of the standard type are installed, but these will be replaced by ticket printing and delivery machines in a few months. Tickets above 6d. in value are issued at the booking office, and a change-giving kiosk is provided. An annual traffic of 50 million passengers can easily be handled in the new station, through which 1,600 trains pass daily.

Lord Ashfield, chairman of the Underground group of companies, presided at the inaugural ceremony, which was performed by the Mayor of the City of Westminster, Major V. B. Rogers, D.S.O., M.C., J.P., on December 10th, in the presence of a large gathering of distinguished guests, who descended the escalators to inspect the lower station and then returned to the booking hall for refreshments.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Car Radiator Heater.

A patented invention of Mr. C. RUSS, 50, George Street, W.1, is a small electric immersion heater designed to be housed in an automobile radiator in place of the radiator drain plug or tap, and for keeping the water above freezing point during cold weather. To it is permanently fixed an electric plug socket, so that the device can be "plugged-in" to any available circuit. A dust cover is incorporated in the design to prevent the sockets from becoming clogged with road dust or mud when the car is in use. The loading is about 100 W, and the heater is claimed to be capable of raising the temperature of three gal. of ice-cold water 16-18 deg. F. in three hours. A tell-tale lamp used with a resistance and attached to the plug socket indicates whether the heater is working properly or not. We understand that the patent of the device is for disposal.

New Cooking Apparatus.

Two important additions have recently been made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, to its wide range of "Magnet" industrial cooking appliances. One of these is a small double-oven range, fig. 1, suitable for a small boarding house or restaurant. The body of the oven is constructed of sheet-steel, double cased and lagged with heat-resisting material, the doors, door-frames, hob-table, mountings, and so on, being of cast-iron. Each oven is fitted with suitable grid shelves, drip pans, &c., and lined with plain sheet-steel or vitreous enamel as desired. On the hob-table over the ovens are fitted boiling plates and a griller-toaster. The overall dimensions are 48 in. by 33 in. by 22 in. Each oven measures 19 in. by 15 in. by 15 in. and is loaded at 3.2 kW. The hob-table carries two 12 in. by 8 in. enclosed boiling plates, each loaded at 3.2 kW, and two similar plates 8 in. by 6 in.,

Fig. 1.—"Magnet" Double-oven Electric Range.

each loaded at 1.6 kW. The ovens and plates are arranged for 3-heat control by means of suitable switches mounted on the front. The single-heat griller-toaster measures 21 in. by 10 in.

and is loaded at 3.6 kW. The other appliance is a hot plate specially designed for the baking of scones and similar work. It is very strongly built up in cast- and wrought-iron, has totally enclosed elements, and is arranged for 3-heat control. The overall dimensions are 5 ft. by 2 ft. 6 in. by 2 ft. 11 in., and the loading is 12 kW.

An Emergency Lighting System.

The "Keepalite" system of emergency lighting has just been placed on the market by the CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester. The object of the system is to provide for offices, large stores, hospitals, &c., a means whereby a limited amount of lighting can be instantly and automatically switched on from a separate source (battery) in the case of emergency. A range of equipments has been standardised to supply low-pressure auxiliary lighting of from 13 up to 300 30-W lamps for one hour, or the equivalent. The batteries are all composed of sealed-in Chloride Planté plate cells. The essential part of the system is the "Keepalite" emergency lighting control panel, fig. 2. This is supplied in two forms of similar external appearance, for use on d.c. and a.c. circuits, respectively. The panel is of the ironclad type, and is suitable for any position. The d.c. apparatus is provided with a d.p. change-over contactor that normally connects the battery through a controlling resistance and milliammeter to the mains, thus maintaining a continuous trickle charge sufficient to keep the battery in a healthy condition. Immediately normal lighting fails the contactor automatically cuts out the resistance and connects the battery to the auxiliary wiring. This wiring need only be of simple character on account of the low pressure employed. On the resumption of normal lighting the contactor is automatically reset in the original position. Means are provided for switching on a higher rate of charge through a heavier resistance, if the emergency discharge has been long enough to draw appreciably on the capacity of the battery. The a.c. panel is generally similar

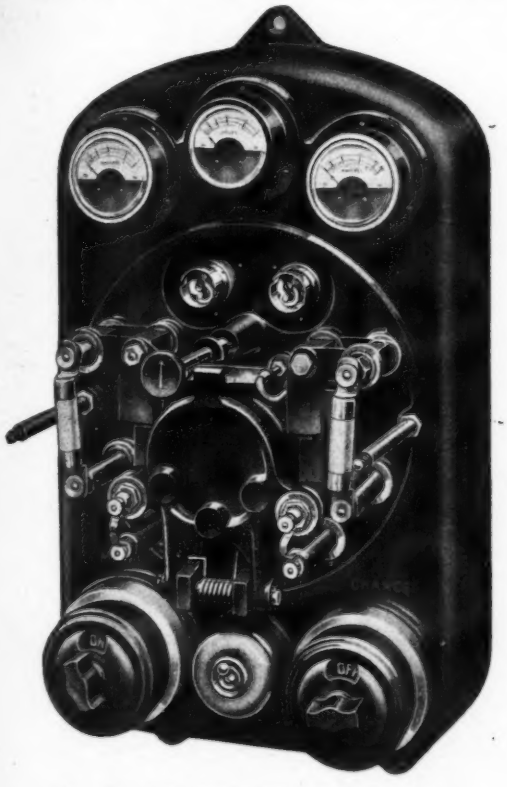


Fig. 2.—The "Keepalite" Control Panel.

to that for d.c., except for a winding on the contactor and the addition of a suitable rectifier to provide for the charging of the battery.

A New Stop Watch.

Messrs. A. ARNOLD & Co., 17, Elmcroft Avenue, Golders Green, London, have recently marketed a 30-hour watch fitted with a stop-watch hand and dial graduated in fifths of a second. The watch does not work on the fly-back principle, but the idea is to provide a serviceable stop watch for rough testing purposes at a figure considerably below the price of an ordinary stop watch.

A Small Oil Switch.

A recent introduction by Messrs. DONOVAN & Co., 47, Cornwall Street, Birmingham, is a small oil-immersed switch, fig. 3, specially designed for use in trades where highly inflammable vapours prevail. It consists of a cast-iron case and cover, suitably flanged, in which is fitted a 5- or 10-A s.p. or d.p. quick-make and -break tumbler switch suitably adapted for oil immersion. The switch is operated externally by a

Fig. 3.—Small Oil-immersed Switch Unit.

handle fitted with an indication pointer. The leads inside the case are arranged above the oil level. The unit is fitted with wall-fixing lugs and provision is made for screwed-conduit, lead-covered or armoured cable entry. Earthing arrangements are provided.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The Electricity Supply Bill.

On December 4th, in the House of Lords, Lord RUSSELL moved the second reading of the Electricity (Supply) Bill, which has passed the House of Commons. He explained that in the Act of 1919 compensation was provided for disestablishment or worsening of employment under, or in consequence of, operations or schemes under the Act. But there was a proviso that the workmen to whom this should apply must have been permanently employed in or about the undertaking at the time of the Act—May 8th, 1919. The position now was that men who had nine or ten years' service were not eligible for compensation because of the provision fixing the date at May 8th, 1919. The present Bill was designed to put the matter right.

Lord ASKWITH suggested that further consideration should be given to the matter, and Lord GAINFORD moved its rejection on the ground of its "far-reaching character." He said that in 1926 Col. Ashley had refused to accept such a proviso as was now proposed, because it would introduce the principle that a man had to be compensated when he had entered into a service with his eyes open. If the Bill were passed, the electricity companies would have no opportunity of displacing or altering the duties of any of their servants without compensating them, even although they gave them adequate notice. If a man were dismissed for inefficiency, the Bill would put a premium on inefficiency.

Lord LONDONDERRY suggested that the Bill might be read a second time, and, if necessary, amendments could be moved in Committee. The Government took a benevolent view of the Bill, and was willing that it should pass into law, provided the electricity undertakings themselves were willing to undertake the liabilities which the Bill might involve.

Lord RUSSELL said that an employer had the complete right to get rid of a man if he thought he was no good, or for any other reason. All that was provided was that where, owing to a new electricity scheme, certain men were squeezed out of their places, they should receive compensation.

The Bill was read a second time.

Wireless Licences.

On December 4th, Sir W. MITCHELL-THOMSON informed Sir R. THOMAS that the total number of wireless licences in force on October 31st last in the whole of Wales was about 80,600, which was equivalent to a rate of 36.5 per thousand of population. The corresponding rate for England was 62.8, for Scotland 37.3, and for Northern Ireland 21.9.

America and British Companies.

On December 4th, Mr. BECKETT asked the Minister of Transport whether his attention had been drawn to the large and rapidly growing influence of American capital in British electricity supply companies; and whether, in view of the importance of British control of these companies and the rapidly expanding nature of their requirements, he would consider

legislation to prevent the domination of these companies by anything but British capital.

Colonel ASHLEY said he was aware that statements had been made from time to time to the effect that American capital was being employed in purchasing shares of companies interested in the electricity supply industry in this country. He did not at present contemplate the introduction of legislation on this subject.

The Imperial Telegraphs Bill.

On December 6th, the House of Commons went into Committee on this Bill, the provisions of which were summarised in our issue of November 30th (p. 952).

Mr. W. BAKER (Lab.) moved an amendment to Clause 1 to delete the provision that the Pacific Cable Board should sell its undertaking to the Communications Company on terms approved by all the partner Governments, and he and supporters of the amendment maintained that cables which cost £7,134,799 were to be handed over for £2,500,000, and it was suggested that £5,000,000 would be a fair figure. For the Government, Mr. A. M. SAMUEL, Financial Secretary to the Treasury, pointed out that the figure was assessed by expert independent valuers. In any event the Imperial Government was not the predominant partner, and could not alter the terms. Mr. L. S. AMERY contradicted the statement that the "beam" system was Government owned, pointing out that although it was operated in this country by the Government, in the other countries concerned there were private companies. The amendment was rejected and the price approved. Another amendment, postponing the operation of the clause from 1928 to 1930, was rejected, and the clause was passed. On Clause 2 Mr. GILLETT (Lab.) moved that the price for the West Indian Cable should be not less than £400,000 (instead of £300,000). Mr. SAMUEL showed that the cable had been losing money for years and was a bad investment. The amendment was defeated, and Clause 2 was passed. Clause 3 was passed after the rejection of an amendment regarding the provident and pension funds of the Pacific Cable Board, Mr. Samuel stating that a Bill to protect the interests of the staff was being promoted at the instance of the Government.

On December 7th, Clause 4 was considered, and in the course of debate, the POSTMASTER-GENERAL (Sir W. Mitchell-Thomson) said that the Imperial Transatlantic Cables were of no use to the Government. Since 1921, when they made a profit, the average annual deficit had been £37,627; last year, owing to "beam" competition, they did not earn enough to cover depreciation. Sir J. GILMOUR, in reply to opposition criticisms, said that the evidence given before the Imperial Conference could not be made public. The Government was satisfied that the price was fair and just. The clause was passed, and during the consideration of additional clauses, none of which was carried, Viscount WOLMER assured the Opposition that the interests of telegraphists and engineers likely to be affected would be protected.

The conclusion of the Committee stage was reached on December 10th. Mr. MALONE (Labour) moved additions providing that the rates of interest and dividend paid by the Communications Co. should be prescribed by the Treasury, and that the company's annual balance sheet and accounts should be presented to Parliament. Mr. GILLETT proposed a clause limiting the company's capital to £20,000,000 unless the Treasury consented to an increase, and Mr. E. GRENFELL (Unionist) moved that the chairman of the company should be a whole-time official approved by the Government. All these amendments were rejected, and the Bill was reported to the House without amendment. The third reading was then taken, and the Bill was passed by 235 votes to 97—majority 138.

Electrical Manufacturers and Reparations.

In reply to a written question by Mr. W. Thorne, the CHANCELLOR OF THE EXCHEQUER last week stated that he had received no protests from British electrical and allied manufacturers against the payment of reparations in kind by Germany. A Committee was to be set up to make recommendations for the final settlement of the reparations question, but he could not say whether any adopted plan would alter the existing system of payment in kind.

Price of Electricity.

On December 6th, Mr. DAY asked the Minister of Transport whether he had approved and could give the names of the special committee appointed by the London and Home Counties Joint Electricity Authority to review the charges and conditions imposed by electricity undertakers in its district; whether any previous investigations had taken place into the charges made by four separate private electricity undertakers, who charged 10d. per kWh; and if he was aware that in some cases local authorities were able to charge only 3d. and 3½d. per kWh, whilst many private electricity undertakers charged 9d. and 10d. per kWh.

Colonel ASHLEY replied that the desirability of carrying out a review on the lines indicated in the first part of the question was, with his approval, suggested by the Electricity Commissioners to the London and Home Counties Joint Electricity Authority, but the appointment by that body of any committee was entirely a matter for them. The charges made by the various undertakers were within the maxima fixed by the Special Acts or Orders relating to the various undertakings, as modified by any subsequent Orders that might have been made for the revision of such maximum charges.

Legal.

Lektophone Corporation v. S. G. Brown, Ltd.

THE hearing began in the Chancery Division, on December 5th, of an action by the Lektophone Corporation of Jersey City, U.S.A., against S. G. Brown, Ltd., for an injunction restraining the alleged infringement of their patent, No. 16,602, of 1914, for an invention relating to wireless loud speakers. The plaintiffs also claimed damages and the delivery up or destruction of all alleged infringing articles under the defendant company's control.

The defendant company denied infringement, and submitted that the patent was invalid because of prior publication and common general knowledge, lack of subject-matter, and insufficient description in the specification; and they asked for the revocation of the patent.

The plaintiffs complained that at the Radio Exhibition, Olympia, last year, the defendant company sold a "Mascot" loud speaker which they said infringed their patent. This was granted to Marcus C. Hopkins, and was for "improvements in or relating to sound regenerating machines." In support of their first allegation the defendant company relied on specifications of Bowley (1899), Stroh (1901), Lumière (1909 and 1912), Brown (1910 and 1911), and Shanks (1906), an American.

Mr. J. WHITEHEAD, K.C., for the plaintiffs, said that Mr. S. G. Brown, the chairman of the defendant company, had been responsible for several celebrated inventions, including the Brown gyroscopic compass, which was the subject of an action before his Lordship some years ago. Counsel proceeded to explain the methods of sound reproduction. He said that a disk of many inches diameter, with a rod attached to its central point at right angles, was probably the ideal way of generating sound waves. A wave emitted by a disk must have a wave-length about eight times the diameter of the disk if the note was to be radiated in perceptible volume. There were therefore obvious advantages in a large disk, but there were also the disadvantages of weight and the force required. Disks had been constructed that were partially rigid and with a free edge. These gave larger standing sound waves by reason of the unconstrained edge, but there was greater liability to "blasting" than with a disk with a confined edge. The making of large disks was not easy because it had been found difficult to get them to keep a plane surface. Dealing with the prior publications relied on, he said that Stroh's related to a sound-box with a horn; the first Lumière to a pleated diaphragm used chiefly in connection with gramophones; and the first Brown specification to telephone receivers, the second to telephone transmitters, and the third to a gramophone soundbox. None of these, he contended, anticipated the plaintiffs' patent.

The first witness was Dr. W. H. ECCLES, past-president of the Institution of Electrical Engineers. His evidence was directed to confirming Mr. Whitehead's remarks regarding the transmission of sound. He said there had been a great deal of investigation of recent years into the best form of loud-speaker horn, and in these days exponential horns were used in connection with any mode of producing sound from a vibrating body. With regard to the Lumière patent of 1909, he said it was a form of loud speaker in large commercial use, and the corrugated diaphragm had been applied to gramophones. The object of the Hopkins invention was to make a sound reproducer that would operate without a horn, and at the same time give a large volume of sound throughout the musical range. That object he considered had been accomplished. He had read and considered each of the prior documents relied on by the defence, and his opinion was that the Hopkins invention had not been disclosed in any of them. The invention was much used in this country. A specimen of the defendant company's alleged infringing instrument was handed to Dr. Eccles, and he said he had examined it, and found that it complied substantially with the particulars given in the plaintiffs' specification.

Cross-examined by Sir DUNCAN KERLY, who said he was instructed that none of the loud speakers on the market made by licensees under the Hopkins patent conformed to the description in the specification. Dr. ECCLES said he had heard a Hopkins loud speaker successfully used in connection with a gramophone.

The hearing was again adjourned.

Bambrick v. Whitstable Electric Co., Ltd.

IN the Chancery Division on December 5th, before Mr. Justice Romer, Mr. Vincent Bambrick sought an injunction against the Whitstable Electric Co., Ltd., to restrain the company from committing a nuisance by vibration and noise. The company generated and supplied electricity under two Orders of 1914 and 1927, and the plaintiffs said that plaster in his premises (a laundry) had been shaken down, that the cap of the boiler-house chimney had become loose and had had to be replaced, that £200 was the price of other repairs, and that because of the way the boiler footings had been affected he feared injury from pipe-fracture, steam or explosion, to employés. The defendants replied that the damage complained of was the result of the vibration of plaintiff's own machinery.

Mr. Bambrick called neighbours in support of his contentions.

Mr. P. J. WALDRAM, consulting engineer and surveyor, was called for the plaintiff, when Mr. Gover (for the company) said that this was a public utility body and if they could come to terms he thought it desirable.

Counsel consulted, and Mr. Gover, in announcing a settlement, said, "the scheme which was proceeding all over the country for transmitting current on the grid-iron system from super-stations had facilitated the conclusion of the dispute." Within a comparatively short space of time there was a practical certainty that this particular station would be turned into a transforming station. The terms of the settlement were not disclosed.

Falk, Stadelmann & Co., Ltd.

IN the Chancery Division, on December 10th, Mr. Justice Eve confirmed alterations in this company's memorandum of association enabling it to extend its objects and engage in wireless business. In making the application, Mr. FARWELL, K.C., mentioned that the company was formed in 1887 with a capital of £10,000; the present capital was over £1,000,000.

Tungsten Manufacturing Co., Ltd.

MR. JUSTICE EVE, in the Chancery Division, on December 10th, confirmed the reduction of this company's capital from £150,000 to £39,330.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Unemployment.

With reference to Mr. R. C. Andersen's letter in this week's issue regarding your leader of November 23rd, whilst I agree with him in the main, I cannot agree that no political party can cure unemployment. I presume by political party he means the Government party in power. I assert that it is their job to alleviate unemployment, as representatives of the people, whatever their politics may be.

In travelling over the country one can see various needs of reconstruction to which men could be put to work. For example: Supposing a Bill were put through Parliament compelling all railways to be electrified within a radius of 30 miles around large towns. This would affect a hundred and one trades—men on the "dole" could be merged—the money now being spent in a loose way would be expended in a useful permanent manner.

There could be a compulsory cultivation of idle ground, and so on. Even a layman cannot fail to see how the many millions of money thrown away could be far better utilised.

Rationalisation would mean upsetting the whole of our decrepit system—it is the system that is wrong. Get rid of that—then rationalisation would follow automatically.

A. W. Saulter.

London, *December 7th*, 1928.

Lincolnshire Electrification.

As a reader of eighteen years' standing of the ELECTRICAL REVIEW I have always considered it a conservative paper. I was somewhat amazed, therefore, to read your leader on "Rural Electrification," with particular reference to the Lincolnshire scheme. You state that the scheme is one of exceptional interest in many respects, and that you hope Dr. Ekström will have a chance to carry it out.

As one who attended the Inquiry at Lincoln, I venture to suggest that the scheme presents no exceptional technical features that British engineers are not already aware of. I was struck by the fact that the bulk of the distributors are to be only No. 8 gauge copper (0.022 sq. in.), and that distribution is to be carried out over a radius of 600 yards from the transforming point. Personally, I pity the consumer who uses anything but lighting off these lines, and I very much doubt if the voltage drop can be kept within the allowed limits. Personally, I consider the rural consumer must have a reasonably reliable service, and this cannot be given with No. 8 S.W.G. copper lines. I also noted that no underground cable is allowed for, therefore how satisfactory service is to be given in towns where several transformer kiosks are necessary is beyond me. Perhaps Dr. Ekström, who admitted his ignorance of our Regulations, is unaware of the fact that he cannot erect e.h.p. lines along public roadways.

The assisted-wiring scheme put forward presented no novel features; in fact those of us who attended the Inquiry hoping to gain experience in rural development came away with a feeling of having wasted 3½ days' valuable time.

If Mr. Borlase Matthews can develop a rural area, surely he should be given not almost the whole of Lincolnshire not covered by Orders, but a compact portion such as the Administrative County of Kesteven, in which to prove his contentions.

Whether the Commissioners will grant the various other Orders remains to be seen, but if they do, and only grant, say, Kesteven to Mr. Matthews, there would still be a good deal of territory left which would no doubt be applied for later by Mr. Matthews and the existing undertakers; then the Commissioners would be in a position to judge who had developed their area most satisfactorily in the intervening period.

I rather fancy that if you obtain a copy of the official shorthand notes you may be inclined to agree with these remarks.

"Lindsey."

December 4th, 1928.

[Dr. Ekström could hardly have "admitted his ignorance of our Regulations," seeing that in our issues of August 5th and 12th, 1927, he critically reviewed the British Regulations then in force; and in our issues of August 3rd and August 31st, 1928, in collaboration with Mr. Vidar Ekström, he made detailed and exhaustive comparisons between the new Regulations and those in force in Sweden. According to our report of the Inquiry, by our special representative, Dr. Ekström said he was working according to the Regulations of the Commissioners, and Mr. John Kennedy gave evidence that he had checked the calculations and estimates and found them fully justified for English conditions. (ELEC. REV., November 30th, 1928, p. 961.)—EDS. ELEC. REV.]

Does it Pay to Acquire Knowledge?

A young man had a desire to become an electrical engineer. His people apprenticed him—indentures, &c.—to a very reputable firm. His apprenticeship complete, he shared the fate of his fellow-apprentices, *viz.*, he was "paid off." Applications for employment to other firms elicited such replies as: "Insufficient experience," "Too young," &c. After much searching and worrying, he eventually procured the post which he is occupying at present; he has held it for a few years now.

During all these years of apprenticeship, and after, he has attended, and is attending, various classes and colleges. He has taken prizes, diplomas, and certificates for Electrical Engineering and kindred subjects.

As a reward for his ambition, knowledge and services, he is in receipt of the colossal salary of just over £125 *per annum!* All electrical apprentices please note! This will be *your* reward! His advice to all apprentices is: "*Get out* of the trade before it is *too late!*"

In conclusion, I may state that his is *not* an isolated case, but one of hundreds.

Corrigenda.

November 30th, 1928.

After reading so many most interesting letters in your paper regarding the above question, I feel I would like to pen my own views on this matter. Before one can answer the above question one must be quite clear as to what type of knowledge is being referred to. By this I mean that, knowing how to do a certain piece of work is one thing, and being able to do it is another matter. I have met many men who, just because they have a degree, consider themselves far above anyone who has not a degree, yet with all their so-called knowledge of how to do things, they are as ignorant as is possible when they are called on to do the work they know so much about.

It does not pay to acquire this type of knowledge, because in these days men are employed because they can do the work, besides knowing how to do it. No man should be in a position over other men unless he can turn to and do the work he is expecting his men to do.

Moral: Start at the bottom of the ladder; then you will find that it does pay to acquire knowledge.

On the Ladder.

December 8th, 1928.

Earth or Insulate?

My attention has been drawn to the letter from Mr. T. C. Gilbert in which he criticises the flexible wire shown in the photograph of the linotype machine in your issue of November 16th.

Although your correspondent's line of reasoning shows signs of slight expansion, I am happily able to reassure him that there are more things in heaven and in this earth question than are dreamt of in his tough-rubber philosophy, and that as a result of precautions which are not immediately obvious in the picture, the shock that he has received from the photograph is the only shock that has been, or is ever likely to be, received from this equipment.

Photographs are notoriously evil counsellors. I remember even the case of a well-known electrical engineer whose portrait, owing to a trick of light, came out showing a perfect halo round his head.

J. M. Crowdy.

London, *December 1st*, 1928.

Radio Battery Eliminators.

That we are heartily in agreement with Mr. R. H. Rawlls' warning (November 30th issue) against the dangers associated with certain types of radio battery eliminators is shown by

our letters of April 3rd and 23rd, 1928, published in your issues of April 13th and May 4th, respectively. We further wrote a letter on the subject to the secretary of the Radio Manufacturers' Association, urging that the draft I.E.E. Regulations be amended to minimise the serious risks involved in the indiscriminate use of d.c. battery eliminators. This was done to a certain extent by the insertion of Clause 129: "Protection of Live Parts.—All parts (including the terminals and connections of batteries) which are alive, or are intended to become alive, from the supply mains shall be so guarded as to prevent accidental contact with such parts under normal conditions of use"; but in a paragraph in the *Wireless Trader* a few months ago we suggested that the significance of this clause might not generally be realised as precluding the use of d.c. units in conjunction with any receiving sets which have unprotected terminals, external l.t. batteries, aerial and earth connections without series condensers, metal screens, cases, switches, dials, screws, &c., accessible to the user.

Such being our view of the matter, its expression is not confined to words of warning, but involves the sacrifice of all business in d.c. battery eliminators, as whatever precautions might be adopted in their design, the probability would still exist of their use in connection with receiving sets not specially adapted to prevent risks of accidental contact with live parts. Page 45 of our catalogue (enclosed) states the position to the public as we see it, and may be of interest to the trade generally in connection with your contributor's article. Attention is directed to the constructive suggestions in the last paragraph.

Burndept Wireless (1928), Ltd.

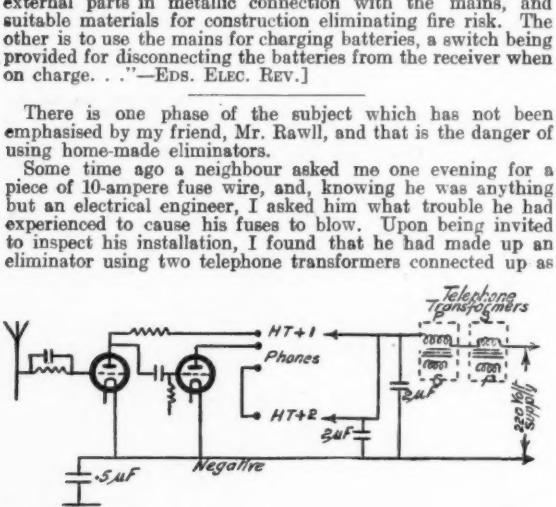
M. J. Scroggie, B.Sc., A.M.I.E.E., *Chief Engineer.*

London, *December 3rd*, 1928.

[We quote from the catalogue as follows: "We constantly receive inquiries for h.t. units for d.c. mains, but, although the manufacture of such appliances is in fact a simpler matter than that of a.c. units, it is our considered opinion that the risks involved in their installation are sufficient to justify the policy of refusing to supply them. . . There are two possible safe methods of utilising d.c. mains for furnishing power for the radio receiver. One is to design a d.c. 'all battery eliminator' and radio receiver all in one unit, with no external parts in metallic connection with the mains, and suitable materials for construction eliminating fire risk. The other is to use the mains for charging batteries, a switch being provided for disconnecting the batteries from the receiver when on charge. . ."—Eds. Elec. Rev.]

There is one phase of the subject which has not been emphasised by my friend, Mr. Rawll, and that is the danger of using home-made eliminators.

Some time ago a neighbour asked me one evening for a piece of 10-ampere fuse wire, and, knowing he was anything but an electrical engineer, I asked him what trouble he had experienced to cause his fuses to blow. Upon being invited to inspect his installation, I found that he had made up an eliminator using two telephone transformers connected up as



in the sketch enclosed. Thus he was using the transformers as both chokes and breaking-down resistances without a small fuse in the circuit. This eliminator had apparently been giving satisfactory service for some time, but had finally broken down to earth.

This was a case where a little knowledge was dangerous. Similar cases, no doubt, may be found in any large town where men are keen on building up their own apparatus, and therein lies the danger.

F. C. Orchard, A.M.I.E.E.

Birmingham, *December 6th*, 1928.

The article by Mr. R. H. Rawll, A.M.I.E.E., in your issue of November 30th, very opportunely points out the possible dangers which may arise from the improper installation of radio apparatus, including eliminators.

Some four years ago in a small article in the Review, I dealt with the undirected and haphazard construction of radio receiving apparatus at that time taking place by the public at large.

Constructional details were given in most of the daily and evening papers, and people were introduced to the technicalities of electrical matters in order to create a sale for components. The question whether the ultimate results justified the tuition of thousands of amateur constructors was apparently quite lost sight of, and a knowledge of electrical matters was eagerly given to all and sundry, as though there was simply nothing in electrical practice as applicable to radio receiver construction.

I felt then, as I do now, that an improper use was being made of this piece of electrical apparatus, and for selfish gains; wireless journals and dealers of radio apparatus simply broadcast useful electrical knowledge that sooner or later was bound to land the constructor in danger.

The appearance of the eliminator was bound to become the dividing line between ignorant construction and practical construction, and whilst I with concern observed the same constructional information being given as in the former case, I felt that it was utterly wrong, and that sooner or later steps must be taken to put matters right, before some fatality occurred.

Surely the I.E.E. can influence the Home Office and make it absolutely compulsory for powers to be given to supply authorities to enable them to inspect radio apparatus which is to be connected to the supply mains.

Any prospective consumer should be required to fill in a radio application form in the same manner as a lighting application form, which would lead to a proper inspection of apparatus and installation, in the interests of the people themselves.

Such a step would ultimately lead to a better condition of both receiving apparatus and attachments now on sale, or coming along in the course of developments, which I for one hope to see properly controlled.

Henry Yapp Fowler.

Liverpool, *December 3rd*, 1928.

Reorganisation and Staff Displacement.

Letters have appeared under the above heading in your issues of the 23rd and 30th ultimo, and although the immediate problem of the E.P.E.A. is to find jobs for displaced members of power-station staffs, the question will have to be approached on a broader basis before a satisfactory solution is found.

To mention but one aspect relevant to the case, the fact has to be faced that in these days of stupendous unemployment at home (unequalled in any part of the globe), naturalisation papers are being granted to aliens who have sufficient influence behind them. The fact that these aliens may have already managed to secure jobs does not detract from the argument, because if their services are really indispensable, they require no camouflage.

On the other hand, to grant an alien the full privileges of a British subject, when there is little likelihood of his ever being called upon to perform the supreme duty which has befallen the present generation, is belittling the honour that British nationality bestows. In any case, in times of stress, it will be futile to reckon on the loyalty of individuals who have thus acquired dual nationality.

It does not necessarily follow that the alien in question enters the industry as a station engineer, but by a process of re-shuffling it may be found that a "power" man is ultimately displaced in order to make room for an alien elsewhere.

Perhaps the "Central Displacement Committee" and the "E.P.E.A." will take appropriate steps to prevail upon Parliament to put a stop to this practice.

M.B.E.

December 5th, 1928.

The Measurement of Emotions.

I was interested in Mr. G. G. Blake's article, entitled "The Measurement of Emotions," in the Electrical Review for November 23rd, since I developed a circuit employing the thermionic valve for a similar purpose over twelve months ago. A full description is given in an article in the *Australasian Journal of Psychology and Philosophy* for June, 1928, and this apparatus has been in use continuously in the University of Sydney since it was first constructed.

F. Langford Smith.

Manchester, *December 1st*, 1928.

Hot Spots in Transformers.

Mr. Norris's opinion, as I understand it, is expressed in his I.E.E. paper and other publications as follows:—

1. The maximum safe load on a transformer depends upon the temperature of the hottest spot.
2. That hottest spot temperature cannot be known by measuring the temperature of the oil.
3. It is valuable, in fact necessary, to know the temperature of the hottest spot and dangerous to rely upon information regarding the oil temperature.

These opinions were criticised by Mr. Kennett's advertisements and by his letters in your paper in these terms:—

(*a*) "The hottest oil temperature is a very satisfactory indication of the true loading of a transformer."

(*b*) "Hot spot indicators are an anomaly."

(*c*) "That a hottest oil temperature of 90 deg. C. is a test of how much load to put on any individual transformer."

Mr. Kennett's advertisements and letters were obviously calculated to discount the idea of hottest spot temperature indication and to advocate reliance upon oil temperature and upon his modest claim to build transformers without hot spots.

Every transformer has, when in use, a hottest spot, and that is what Mr. Norris evidently refers to in his published notes on the subject.

To prevent misunderstanding, perhaps Mr. Kennett will give us references to the "advertisements and writings"

mentioned in his firm's advertisements which read as follows :—

"A good deal has been written and advertised lately of the virtues of 'hot spot' indicators and 'hot spot' measurement."

"'Hot spot' indicators are an anomaly."

"Hackbridge transformers are designed without 'hot spots.'"

It would interest many of your readers to have access to those advertisements and writings.

Southerner.

December 4th, 1928.

Recently Mr. Kennett was responsible for advertisements in this and other technical journals from which the following is a typical extract :—

"A good deal has been written and advertised lately of the virtues of 'hot spot' indicators and 'hot spot' measurement."

Since nothing, to my knowledge, has been written or advertised recently on "hot spots," I assumed that the Hackbridge Electric Construction Co., Ltd., used the terms "hot spot" and "hottest spot" synonymously, and were referring to recent publications and advertisements in the *Journal* of the Institution of Electrical Engineers and elsewhere on "hottest spot" temperatures and safe load indicators.

They have since denied both these assumptions.

If, therefore, the Hackbridge Electric Construction Co., Ltd., did not intend their advertisements to mislead engineers into thinking that transformers could be built without "hottest spots," it is for them to substantiate their statement that "A good deal has been written and advertised lately" about "hot spots" as they have since defined the term and as distinct from "hottest spots."

E. T. Norris.

Chorlton-cum-Hardy, *December 4th*, 1928.

Transformers for X-ray Purposes.

I notice in your issue of the 30th ultimo reference to the recent specification published by the British Engineering Standards Association; may I be allowed to criticise one statement with regard to the intensity of the X-ray output as being dependent upon the peak voltage rather than the r.m.s. voltage? For many years I have been up against this argument, and have always held that this is most misleading to any worker interested in comparing X-ray intensities.

It is easily possible to erect two X-ray machines, one, for the sake of argument, giving a peak voltage of 100 kV and 50 milliamperes, and the other to give, for example, 80 kV and 50 milliamperes, and for the latter to be infinitely better as regards the X-ray energy falling upon the photographic film. This is a matter of every-day practice which completely contradicts your statement; the reason is that in my last example the effective voltage is much nearer to the peak voltage than the former, or, in other words, that the X-ray intensity *does* depend upon the *effective* voltage.

I brought up this point at the combined meeting of the Institution of Electrical Engineers and the British Institute of Radiology last week, as I then hoped to enlist the aid of electrical engineers in producing a new instrument which would measure effective voltage at a reasonable cost rather than continue to use sphere gaps which only measure peak pressures.

I also addressed a letter to the Committee who were discussing this new specification, and I much regret their decision to adhere to the old method, as I cannot help thinking that this is most misleading.

A. C. Gunstone.

London, *December 4th*, 1928.

[Several letters have been received too late for inclusion in this issue.—EDS. ELEC. REV.]

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

13,943. "Talking films." J. L. Baird and Baird Television Development Co., Ltd. May 13th, 1927. (300,592.)

12,944. "Synchronising mechanisms." J. L. Baird and Baird Television Development Co., Ltd. May 13th, 1927. (300,517.)

15,405. "Electric radiator fires." S. Z. de Ferranti and Ferranti, Ltd. June 9th, 1927. (300,565.)

16,627. "Electric protective devices." British Thomson-Houston Co., Ltd., J. G. Wellings, and C. W. Wood. June 22nd, 1927. (300,234.)

18,122. "Electric switches." R. B. Stephenson and E. C. Gorman. July 8th, 1927. (300,528.)

18,440. "Synchronous motor for working clocks, tariff apparatus, or the like." Allgemeine Elektricitäts Ges. July 15th, 1926. (274,466.)

18,737. "Electric battery, more particularly consisting of dry cells." H. Panisch (trading as Elektrochemische Fabrik Dr. F. Spitzer). July 14th, 1926. (274,485.)

21,103. "Electric heat-radiators." A. F. Berry. August 10th, 1927. (300,568.)

21,241. "Agricultural and like electric tractors." A. T. Clark and F. W. H. Shepherd. August 12th, 1927. (300,533.)

21,321. "Switches, pushes, and the like used in conjunction with electric motor-car hooters, electric bells, and the like." Igranic Electric Co., Ltd., and F. Clayden. August 13th, 1927. (300,535.)

21,353. "Manufacture of luminous electric discharge tubes containing rare gases." J. B. J. M. Abadie. August 14th, 1926. (276,019.)

21,363. "Secondary batteries." D.P. Battery Co. Ltd., and J. Waddell. August 13th, 1927. (300,536.)

21,626. "Electrolysis of brine." A. Carpmael (I. G. Farbenindustrie Akt. Ges.). August 16th, 1927. (300,603.)

21,687. "Electro-magnetic devices for use in sound reproducing or recording devices." Columbia Graphophone Co., Ltd., and F. A. Mitchell. August 17th, 1927. (300,579.)

21,774. "Inductance and like coils." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). August 18th, 1927. (300,692.)

21,825. "Devices for testing electric voltage regulators." M. B. Redfern (legal representatives of C. G. Redfern, deceased). (Naamlooze Vennootschap Maschinerieen en Apparaten Fabriken). August 18th, 1927. (300,696.)

21,927. "Imitation fires." Automatic Telephone Manufacturing Co., Ltd., and P. N. Roseby. August 19th, 1927. (300,702.)

24,861. "Circuit arrangements in automatic and semi automatic telephone systems." Siemens Bros. & Co., Ltd., and A. E. Caswell. September 21st, 1927. (300,743.)

25,016. "Devices for the interconversion of electric oscillations and sound waves or equivalent mechanical vibrations." British Thomson-Houston Co., Ltd., A. P. Young and J. Hutt. September 22nd, 1927. (300,744.)

26,948. "Fluid operated brakes for tramway and other rolling stock." Electro-Mechanical Brake Co., Ltd., G. N. Cadbury and S. Smith. October 11th, 1927. (Cognate application 35,074/27.) (300,754.)

27,780. "Sound-emitting apparatus of loud-speaker type." S. G. Brown. October 19th, 1927. (300,761.)

29,034. "Method of and means for controlling the intensity of a pencil of light." Siemens & Halske Akt. Ges. November 1st, 1926. (279,907.)

29,722. "Earthing switch for wireless aerials and like purposes." E. H. Whatton. November 7th, 1927. (300,780.)

30,299. "Construction of rotors for high-speed machines." English Electric Co., Ltd., A D Sloan and F. A. Youngmark. November 11th, 1927. (300,789.)

30,423. "Electric motor control systems." General Electric Co., Ltd., and E. H. Croft. November 12th, 1927. (300,791.)

31,135. "Diaphragms for loud-speakers." W. Hyams. November 19th, 1927. (300,792.)

31,267. "Electrical water heating apparatus for domestic purposes." C. W. Thoerig and H. Karvaly. November 19th, 1926. (280,965.)

31,946. "Process for improving the efficiency of electrothermic installations and apparatus for carrying the said process into effect." H. V. de Christiani and A. Cuminatto. November 28th, 1927. (300,799.)

34,452. "Mounting of furnace electrodes." Soc. Electro-Metallurgique de Montricher. October 26th, 1927. (Patent of addition not granted.) (299,414.)

34,589. "Brush-gear of dynamo-electric machines." English Electric Co., Ltd., and E. H. H. Hassler. December 21st, 1927. (300,817.)

35,331. "Electric cable." Naamlooze Vennootschap Handelmaatschappij Cablon (Cablon Corporation). October 18th, 1927. (298,969.)

35,469. "Pyro-recording paper and the like, suitable for use in picture and the like telegraph receiving apparatus." Marconi's Wireless Telegraph Co., Ltd. December 31st, 1926. (282,759.)

1928.

511. "Electrical conductors." A. E. Hughes and Liverpool Electric Cable Co., Ltd. January 6th, 1928. (300,836.)

614. "Submarine or land cable telegraph systems." E. S. Heurtley. January 13th, 1927. (283,550.)

3,048. "Protective choking-coil for high-tension electric installations." Siemens-Schuckertwerke Akt. Ges. February 9th, 1927. (285,031.)

3,683. "Electric cooking plates, hot-plates and warmers." Akt. Ges. Kummler & Matter. September 28th, 1927. (297,791.)

3,826 "Systems of electric distribution." British Thomson-Houston Co., Ltd February 24th, 1927. (285,872.)

6,884. "Electromagnetic sound recorders and reproducers." British Thomson-Houston Co. Ltd March 10th, 1927. (286,719.)

7,085. "Loud-speaker for radio-telephonic purposes." Radiophon Co. January 27th, 1928. (300,849.)

8,646. "Electrically-released doorbolt with alarm for use on bathroom doors and the like." C. R. Tack. March 21st, 1928. (300,861.)

11,923. "Circuit arrangement for electric brakes in motor-truck trains comprising at least two motor-trucks." Maschinenfabrik Oerlikon. April 22nd, 1927. (289,099.)

12,353. "Sound record films." H. J. Kuchenmeister. November 2nd, 1926. (Divided application on 286,188.) (289,446.)

14,409. "Sound-reproducing apparatus." British Thomson-Houston Co., Ltd. May 18th, 1927. (290,635.)

15,421. "Simultaneous low-frequency and carrier-frequency telephony." Siemens & Halske Akt. Ges. May 27th, 1927. (291,110.)

16,910. "Electric fires or radiators." H. H. Berry. June 11th, 1928. (300,886.)

18,360. "Electrical circuit-controlling apparatus." Metropolitan-Vickers Electrical Co., Ltd. June 25th, 1927. (292,924.)

21,870. "Aerials." Telefunken Ges. fur Drahtlose Telegraphie. July 28th, 1927. (294,662.)

25,440. "Electrically-driven hoists." H. Stahl. September 29th, 1927. (297,824.)

30,759. "Mounting of furnace electrodes." Soc. Electro-Metallurgique de Montricher. October 26th, 1927. (Divided application on 299,414.) (299,429.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 5th :—

Sun and Rays (design only), No. 493,881, and Electro Lux (lettering and design), No. 493,883. Class 8. Machinery of all kinds. No. 493,884. All goods in Class 18.—Electrolux, Ltd., 153-155, Regent Street, W.1.

Pep (lettering and design). No. 486,883. Class 8. Electric cells and batteries.—Etablissements Veuve P. Delaton & Cie., Paris. (British representatives: D. Young & Co., 11-12, Southampton Buildings, Chancery Lane, W.C.2.)

Laswor. No. 495,156. Class 8. Electric batteries (not for medical purposes).—B. Braunstein, 109, Guildford Street, W.2.

Avveriyte. No. 495,225. Class 13. Electric lamps (ordinary).—H. Winter, 20, Hampstead Road, N.W.1.

Birmingham Electric Club.

The annual dinner will be held on March 8th, 1929, not March 22nd, as previously announced. A discussion will take place on March 22nd.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—210 houses, for Corporation (£104,000); city architect.

ACCRINGTON.—School, Spring Hill; director of education.

ARGYLLSHIRE.—Extensions to factory at Kinlochleven, for British Aluminium Co.; company's architectural department, Burntisland, Fife.

BATH.—Boys' secondary school, Beechen Cliff, for the City E.C.; director of education.

BIRKENHEAD.—Elementary school, Rock Ferry; borough engineer.

BIRMINGHAM.—Cinema, 288-300, High Street, Harborne, for H. A. Barber, estate agent, 5 and 6, Grosvenor Chambers, Broad Street Corner.

BLACKBURN.—Church of St Gabriel; Rev. A. Smith, vicar designate.

BOLTON.—Girls' school, for SS. Peter and Paul's Church; H. Greenhalgh, architect, Mawdsley Street Memorial hall, Deansgate; Y.M.C.A.

BOSTON.—Houses (232), for the R.D.C.; A. Barton, architect, 15, Market Place.

BURNLEY.—Extension of electricity offices, workshops and stores (£7,800); borough engineer.

CAMBRIDGE.—Cinema, café, &c., Market Hill, for a local company; Eric Pointer, managing director.

CANVEY ISLAND.—Council offices, for the U.D.C.; surveyor

CHELMSFORD.—Houses (100), for the T.C.; F. R. Absalom, Ltd., builders, Cambridge.

CHELTENHAM.—66 houses, Folly Lane estate; Mr. Malvern, Corporation architect. Extensions, Cheltine Works, Chester Walk; T. E. Whitaker.

CHESTERFIELD.—School, Newbold, for the Borough E.C.; Parker Morris, clerk.

CLECKHEATON.—Additions to wire works, Exchange Street; C. Hirst & Sons, Ltd. Additions to Highfield Mills, Heaton Street; J. Sharp.

CORRINGHAM (Essex).—Block of 10 shops and 11 houses and shops, Gifford Cross, for A. E. Frost.

DUDLEY.—Extensions, workshop, Stourbridge Road; F. Flannagan.

EASTBOURNE.—Additions, Boys' Grammar School, St. Annes Road; borough engineer. Church, for Four-Square Gospel Alliance, Upperton Road; S. G. Ward, architect. Turkish baths (£9,825); J. Bodle, Ltd.

EDINBURGH.—Men's and women's hostels, for the T.C.; burgh engineer.

FIFESHIRE.—Additions to Beath Secondary School (electrical and heating work); G. Sandilands, architect and master of works, Education Offices, Kirkcaldy.

FOLKESTONE.—Extensions, Sandgate Road, for Timothy White (1928), Ltd., 30, Chandos Street, Portsmouth.

GREAT HARWOOD.—Alterations to sewage works (£11,120), for Clayton-le-Moors and Great Harwood Sewage Board.

HULL.—'Bus depôt, Barnsley Street (£28,000); city engineer.

ILKESTON.—32 houses, Southern estate; borough engineer. Extensions, Hallcroft central school; education architect.

IRISH FREE STATE (Limerick).—Extension of Technical Institute (£5,000), for the Limerick Technical Committee.

KETTERING.—Housing scheme (70), by direct labour, for the U.D.C.; surveyor.

LEEDS.—252 houses, 100 cottage flats and seven shops, Stanningley Road estate; city engineer. 56 flats and 24 houses, Middleton estate; Paul Rhodes, Ltd. Crematorium chapels, &c., Cottingley Hall cemetery (£40,000); city engineer.

LIVERSEDGE.—Additions to wire works, off Bradford Road, Liversedge; J. Rigby & Sons, Ltd.

LONDON (East Ham, E.).—Factory, rear of 83, Shaftesbury Road; H. W. Binns. 234 houses, estate off Roman Road; J. Stokes & Son.

(Poplar, E.).—200 tenements; Housing Committee.

(Highgate, N.).—Alterations and electric lighting, council school; Hornsey Education Committee.

LONDON—*continued.*

(Hornsey, N.).—Extensions, Albert Works, Spencer Road; W. Bolt. Offices and printing works, Tottenham Lane; H. Baily, 73, Queen Victoria Street, E.C.4.

(New Cross, S.E.).—Bazaar premises, 279-281, New Cross Road, for F. W. Woolworth & Co., Ltd., Kingsway.

(Southwark, S.E.).—Additions, Messrs. Spicer's premises, Red Cross Street and Union Street; F. W. Troup, Gray's Inn Square. Cinema, St. George's Road; Percy Brown and Sons, Pearl Buildings, Northumberland Street, Newcastle.

(Fulham, S.W.).—Tenements, School site, Harwood Road; L.C.C. architect.

(Streatham, S.W.).—Estate development, five streets between Leigham Court Road and Mount Nod Road; J. S. Quilter & Sons.

(Wimbledon, S.W.).—Alterations, Wandle Mill; R. J. and J. S. Thomson.

MALTBY.—Secondary school (£30,000), with electrical work, for West Riding E.C.; education architect, Wakefield.

MANCHESTER.—1,404 houses, Barlow Moor estate; city architect.

MERTHYR.—Hall, Bridge Street, Troedyrhiw; Independent Labour Party.

MERTON & MORDEN.—Extensions to offices (£6,000), for the U.D.C.; G. Jerram, surveyor.

NORTHAMPTON.—Commercial photograph works, Clarence Avenue; H. Moore. Engineering workshop, St. Andrew's Street; A. H. Allen. Extensions, factory, Pine Street; Impress Leather Co.

NORTHFLEET.—Workshops, Shepherd Street; C. & F. Butcher.

OSWESTRY.—Extension of the Boys' High School; clerk to the school.

ROTHERHAM.—Central library (£16,000), for the T.C.; borough engineer.

SALFORD.—Firemen's quarters, central fire station (£13,500); A. Rafferty.

SHEFFIELD.—44 houses, Wybourn estate; city architect.

SITTINGBOURNE.—Additional 50 or 60 houses, for the U.D.C.; surveyor.

SKELMANTHORPE (Huddersfield).—School (£17,000), for West Riding E.C.; director of education, Wakefield.

SMETHWICK.—Works extensions, Cape Hill; Mansill, Booth and Co., Ltd.

SOUTHEND-ON-SEA.—Church (£10,200), for West Leigh Baptist trustees; Rev. F. G. Wheeler, pastor. Bazaar premises, High Street, for Marks & Spencer, Ltd., London. St. Augustine's Church, Thorpe Bay; H. W. Allardyce, architect.

STRETFORD.—Printing works and offices, Stretford Road; J. Broad & Co., Ltd. Cinema and shops, Moss Road; J. W. Maunders.

TAMWORTH.—Houses (56), for the T.C.; Eadie Towers and Co., builders, Wolverhampton.

THIRSK (Yorks.).—Bank, Yorkshire Penny Bank; J. Whitaker, architect, Leeds; H. E. Turner & Sons, builders, York.

THORNE (Doncaster).—School (£34,000), for West Riding E.C.; education architect, Wakefield.

TONBRIDGE.—Extensions, Capel Hospital, for the R.D.C.; Frank Harris, surveyor (returnable deposit of £1 1s.).

WAKEFIELD.—Concert hall, Southgate; West Riding Tramways Club Committee.

WALLASEY.—Two elementary schools, Moreton and South divisions; Education Committee.

WARRINGTON.—Office accommodation; Corporation Special Committee. Dirt racing track, Slutchers Lane; Dirt Racing Track Association, Ltd.

WINDSOR.—Printing works, for Oxley & Son, *Windsor and Eton Express*; J. & H. Ottrey, builders.

WIRRAL.—Houses (32), Pensby Road, Pensby, for C. Peers.

YORK.—Development estate off Hull Road; Garrow Hill Estate Co.